EXPERIMENTAL ORF IN SUSCEPTIBLE AND PREVIOUSLY INFECTED SHEEP

VOLUME II

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PLATE 1: Experimental orf lesion on the skin of a susceptible lamb four days post-scarification. The lines of scarification were contiguous and raised above the surface of the skin. Vesicles occurred in the centre of the lesion.


Leak #2
7
4 kgs psi

PLATE 2: Experimental orf lesion on the skin of a susceptible lamb six days post-scarification. The surrounding zone of congestion was still present.


LAMB 7
6 DAYS. PI.
25/5/TR.

PLATE 3: Experimental orf lesion on the skin of a susceptible lamb eight days post-scarification. The pustules were enlarged and confluent along the lines of scarification.


LAMB. T.
8 DAYS PI
7-5-T2.

PLATE 4: Experimental orf lesion on the skin of a susceptible lamb. Removal of the scab revealed a vascular bed of prominent swollen dermal papillae, a feature pathognomonic of orf infection.


56

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6 DAYS. P.I.
25/5/TR.

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LAMB. 7.
8 DAYS PI
7-5-TR

PLATE 4: Experimental orf lesion on the skin of a susceptible lamb. Removal of the scab revealed a vascular bed of prominent swollen dermal papillae, a feature pathognomonic of orf infection.


56

PLATE 5: Experimental orf lesion on the skin of previously infected sheep one day post-scarification; no sign of a specific reaction.


Sheep no
715
24 hrs
27/1/76

PLATE 6: Experimental orf lesion on the skin of previously infected sheep two days post-scarification. The site of infection was erythemic and the lines of scarification were congested and raised above the surface of the skin.


Sheep no
715
2 days PS
28/1/76

PLATE 7: Experimental orf lesion on the skin of previously infected sheep three days post-scarification. The papules were complete, each being surrounded by a zone of congestion.


ORF
Sheep No
455
3 days PI
14.3.74

PLATE 8: Experimental orf lesion on the skin of previously infected sheep four days post-scarification. Vesicles were present along the lines of scarification.


Kamil. 166.
4 Days. SI
23/5/72.

PLATE 9: Experimental orf lesion on the skin of previously infected sheep six days post-scarification. The whole lesion was one confluent pustule.


C71
13/5/70

PLATE 10: Experimental orf lesion on the skin of previously infected sheep eight days post-scarification. The whole lesion was covered by a scab.


AMB. 166.
DAYS. PI
27-5-72

PLATE 11: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus one day post-scarification. The prickle-cell layers of the epidermis were markedly thickened. X 350

PLATE 12: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus 42 hours post-scarification. The uppermost cells of the epidermis were enlarged and showed the first sign of ballooning degeneration.

X 350

PLATE 13: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus three days post-scarification. Ballooning degeneration was pronounced, affecting most of the upper cell layers of the epidermis. Intracytoplasmic inclusion bodies were not observed within the affected cells. X 350

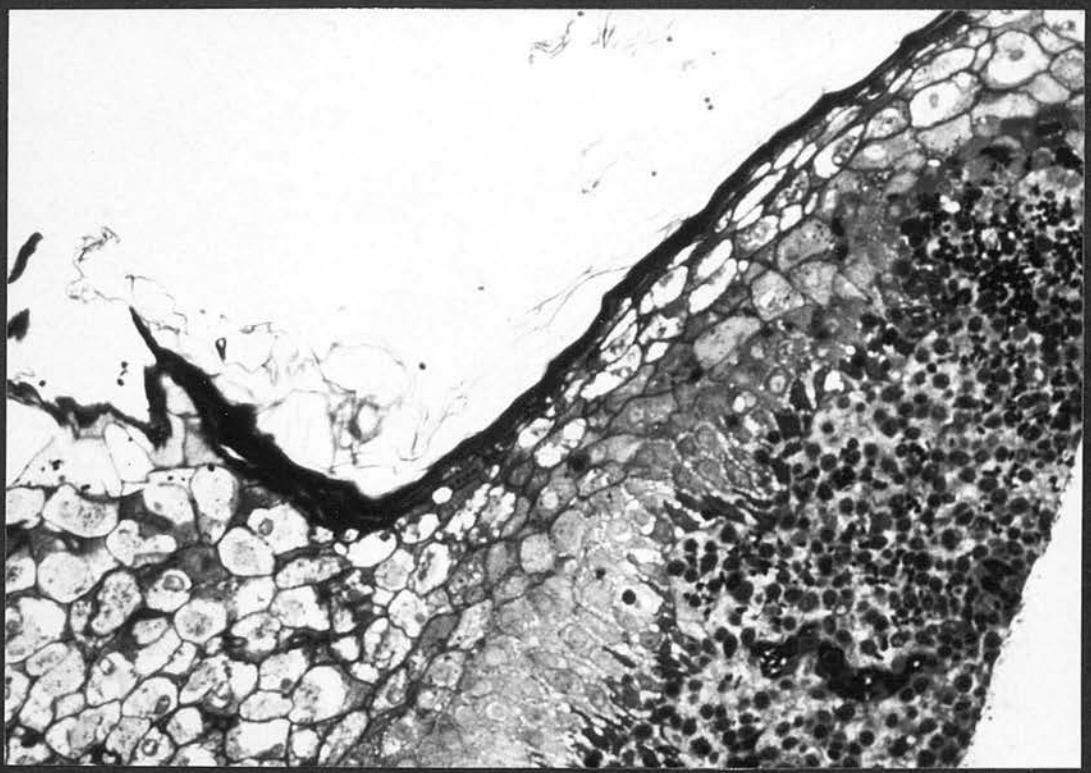


PLATE 14: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus four days post-scarification. A vesicle appeared at the top of the lesion beneath the skin surface and ballooning degeneration affected the whole epidermis. X 250

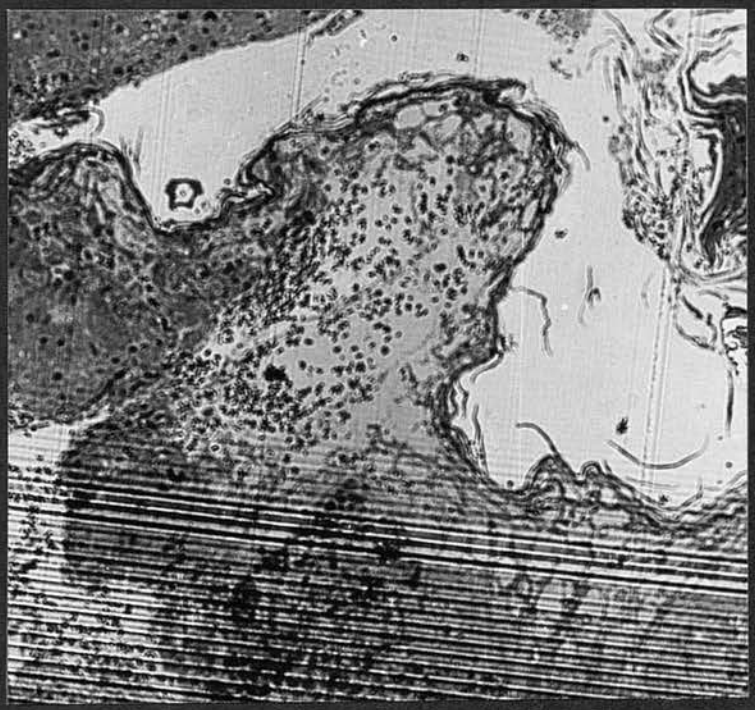


PLATE 15: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus four days post-scarification. All cellular structures were destroyed except for the basal cell layer. Ballooning degeneration was very prominent and affected the cells of the root sheaths of the hair follicles in the region of the lesion.

X 250

PLATE 16: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus five days post-scarification. Vesicles were fully formed, the roof of which consisted of the remains of the cells of the Stratum granulosum. The floor was formed by the degenerated cells of the Malpighian rete. There were many newly formed blood vessels in the dermal papillae. Cellular infiltration of the dermis increased and consisted mainly of polymorphs, lymphocytes and macrophages. X 250

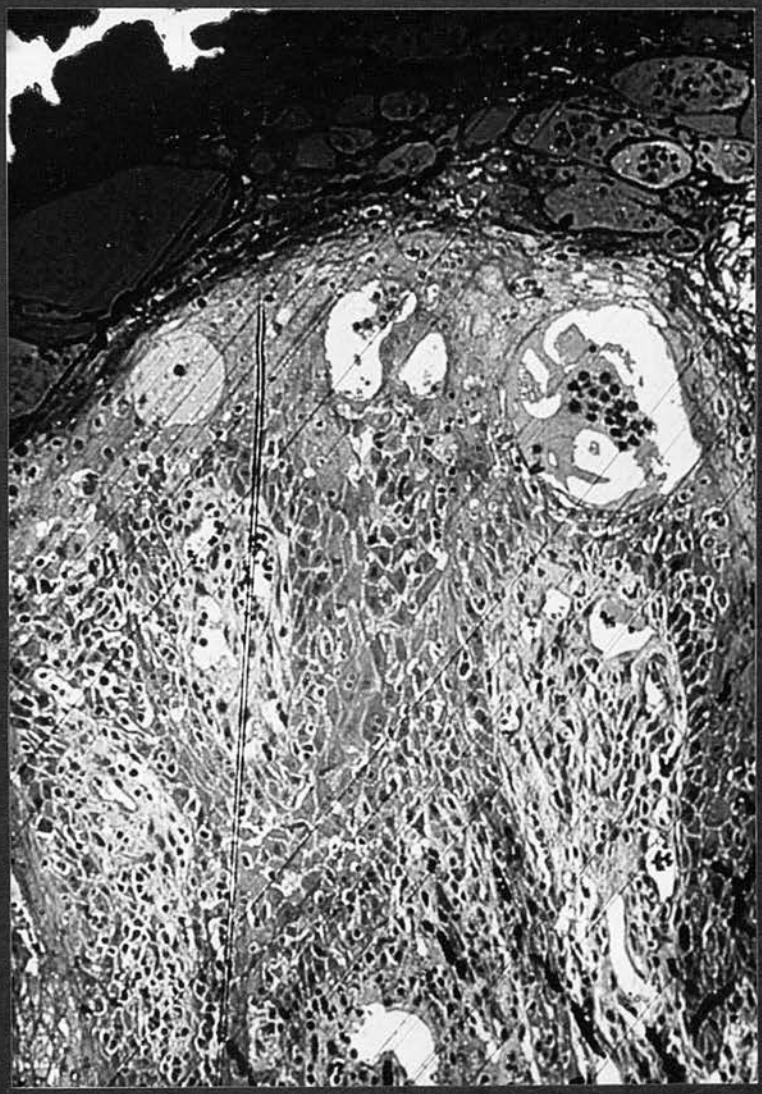


PLATE 17: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus 10 days post-scarification. The whole lesion was in a pustular state. Ballooned cells were still present but in small numbers being located at the top of the pustules. The dermal papillae were more proliferative towards the dermis which contained numerous inflammatory cells. The blood vessels were numerous. X 140

PLATE 18: Histological section, stained with toluidine blue, of the skin of a susceptible lamb infected with orf virus 15 days post-scarification. The line of demarcation between the epidermis and dermis was prominent. The cells of the basal cell layer were organised. The epidermis appeared thick and the dermal papillae were proliferative. A few deeply stained round cells were still present in the dermis and between dermal papillae. X 140

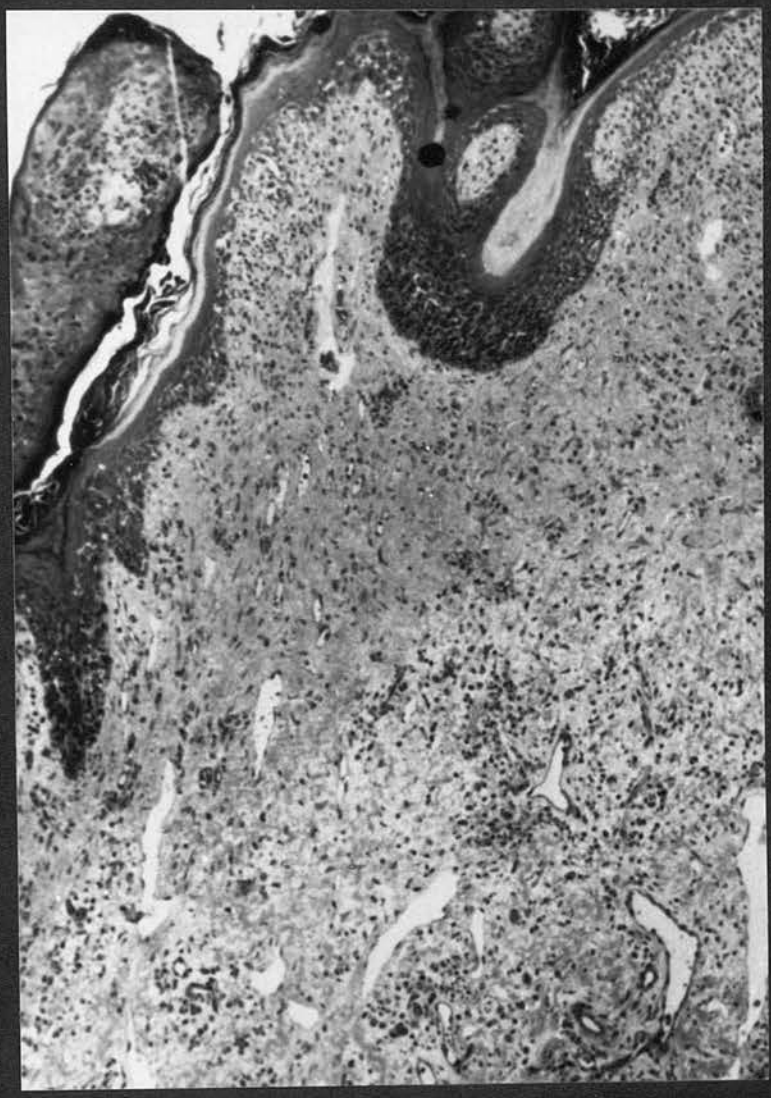


PLATE 19: Histological section, stained with toluidine blue, of the skin of a previously infected sheep challenged with orf virus one day post-scarification. There was a slight thickening of the epidermis due to the enlargement of the cells of the prickle-cell layers. No changes occurred in the dermis. X 350

PLATE 20: Histological section, stained with toluidine blue, of the skin of a previously infected sheep challenged with orf virus three days post-scarification. Ballooning degeneration affected most of the epidermal layers. The ballooned cells were granular and few of them contained nuclei. There was no sign of intracytoplasmic inclusion bodies in the ballooned cells. The dermis was heavily infiltrated with inflammatory cells. X 250

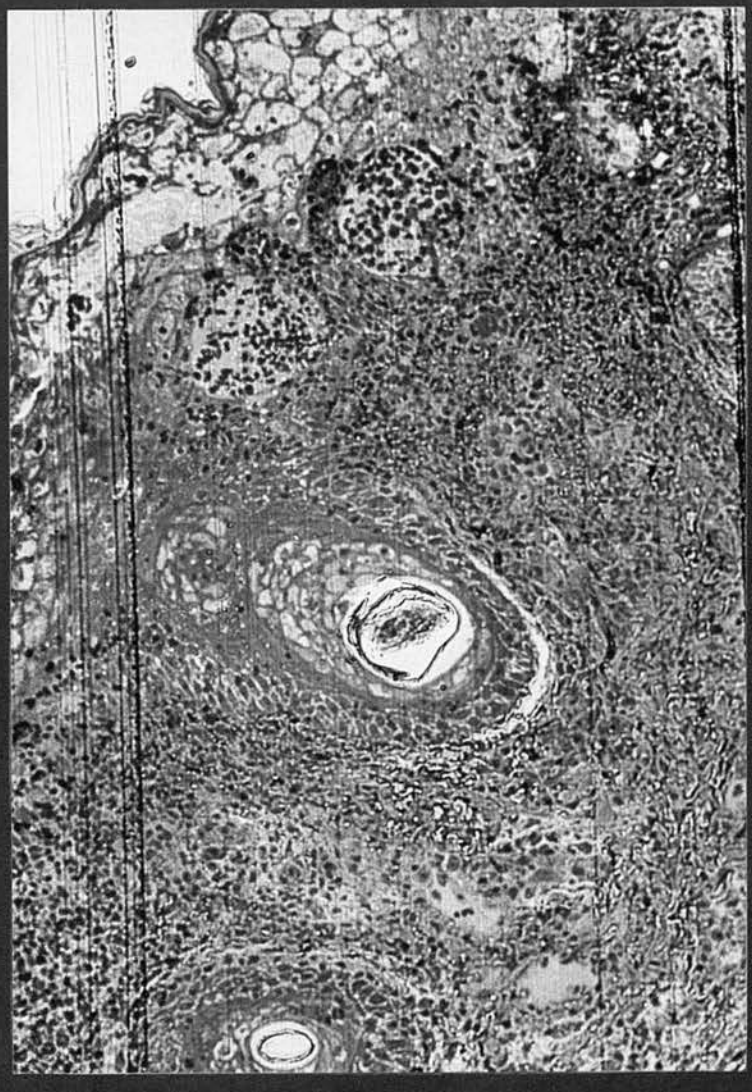


PLATE 21: Histological section, stained with toluidine blue, of the skin of a previously infected sheep challenged with orf virus four days post-scarification. The ballooning degeneration affected all the epidermal cells and the demarcation between the epidermis and dermis was obscure because of invading inflammatory cells. X 350

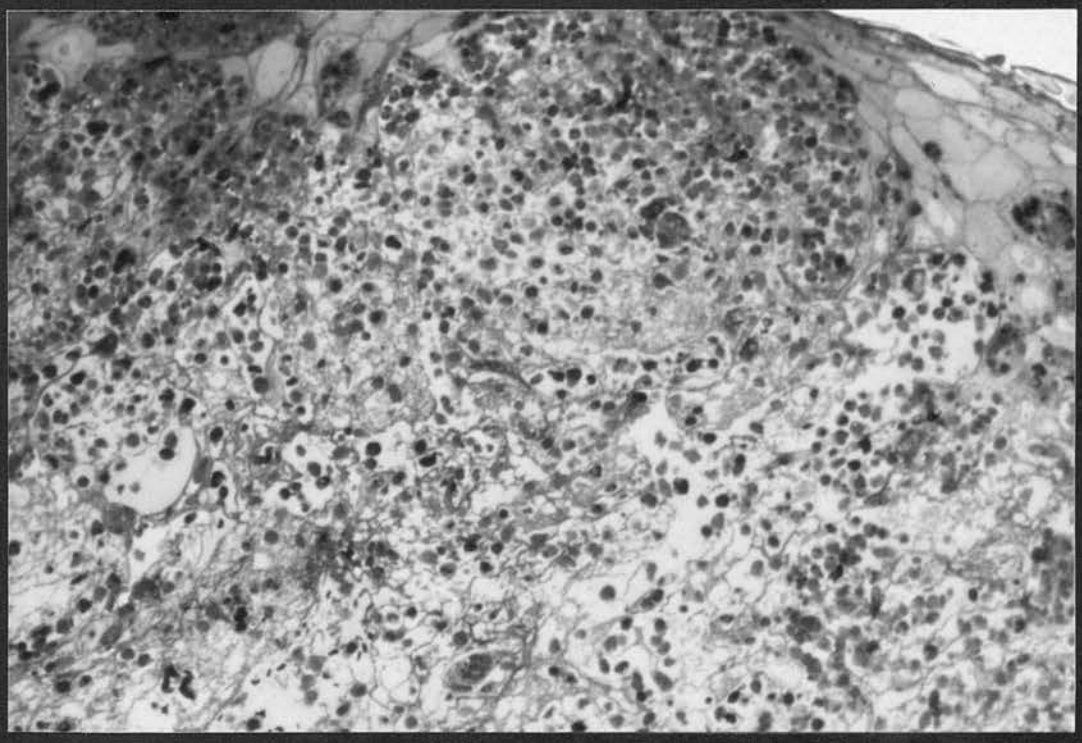


PLATE 22: Histological section, stained with toluidine blue, of the skin of a previously infected sheep challenged with orf virus six days post-scarification. The whole lesion was so heavily infiltrated with inflammatory cells that other constituents were obscured. X 250

PLATE 23: Histological section, stained with toluidine blue, of the skin of a previously infected sheep challenged with orf virus 10 days post-scarification. The epidermis was thick. In the dermis a few rounded cells were present. X 350

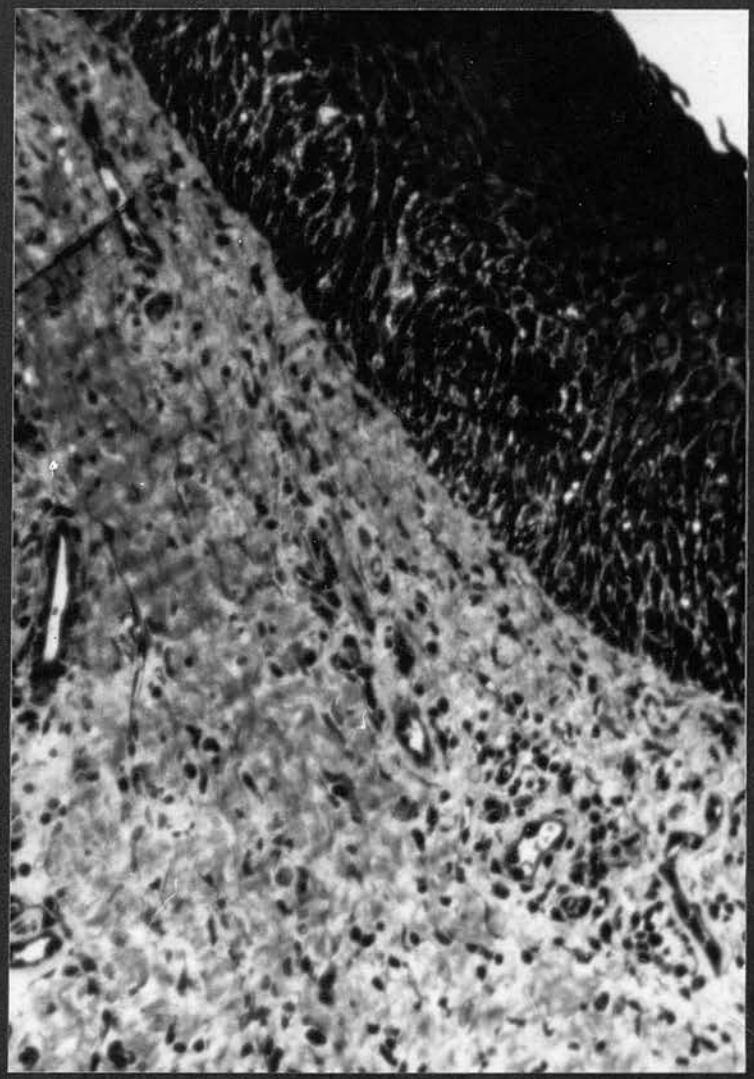


PLATE 24: Electron micrograph of the skin of a susceptible lamb 30 hours after infection with orf virus. The cells of the uppermost layers of the epidermis show electron-dense granular material perinuclearly in their cytoplasms. X 15,000

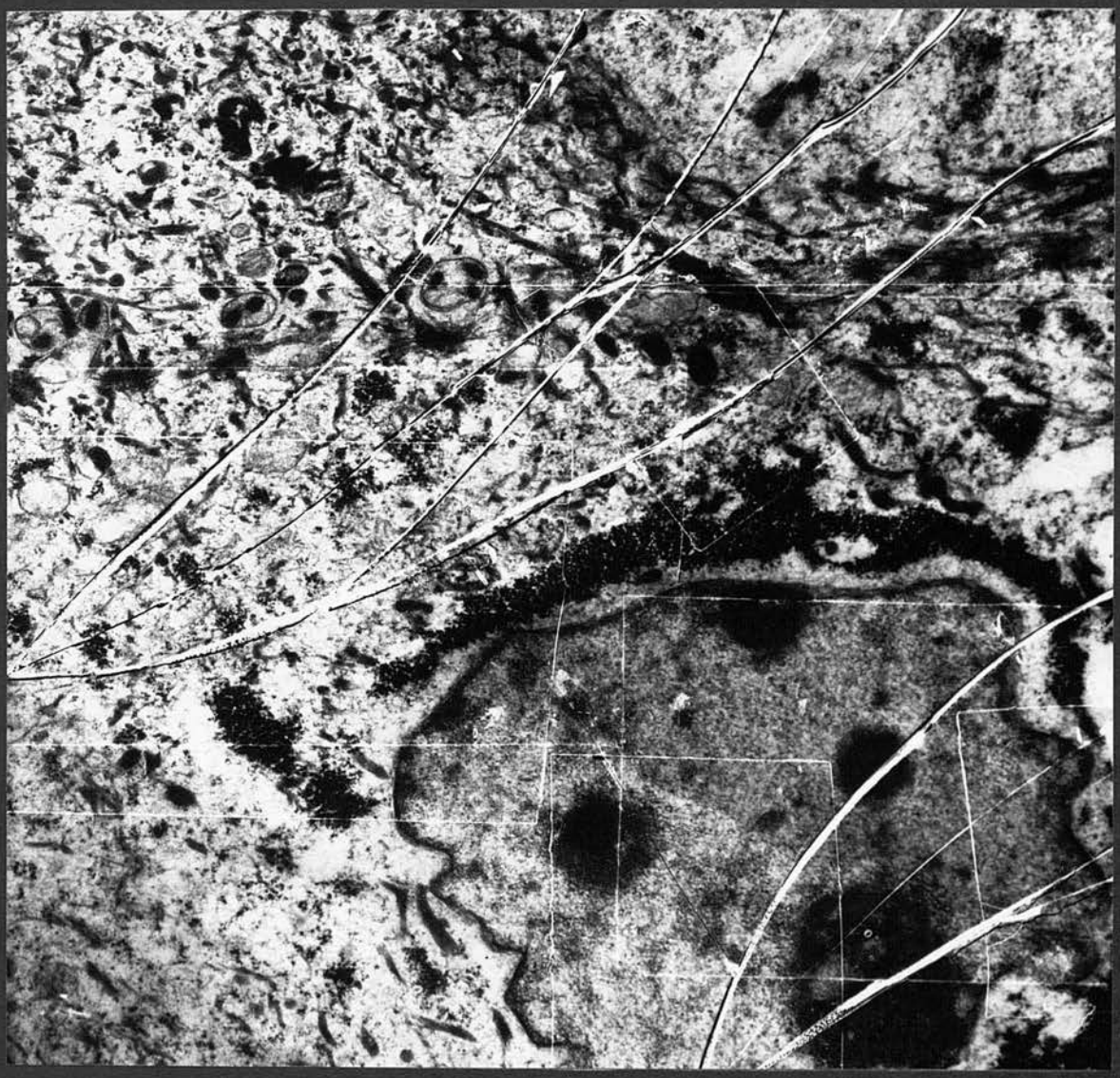


PLATE 25: Electron micrograph of the skin of a susceptible lamb 30 hours after infection with orf virus. The electron-dense material is diffusely distributed in the cytoplasms of infected cells. A few mature and immature orf virus particles are present in the cytoplasms but not in the nucleus.

X 15,000

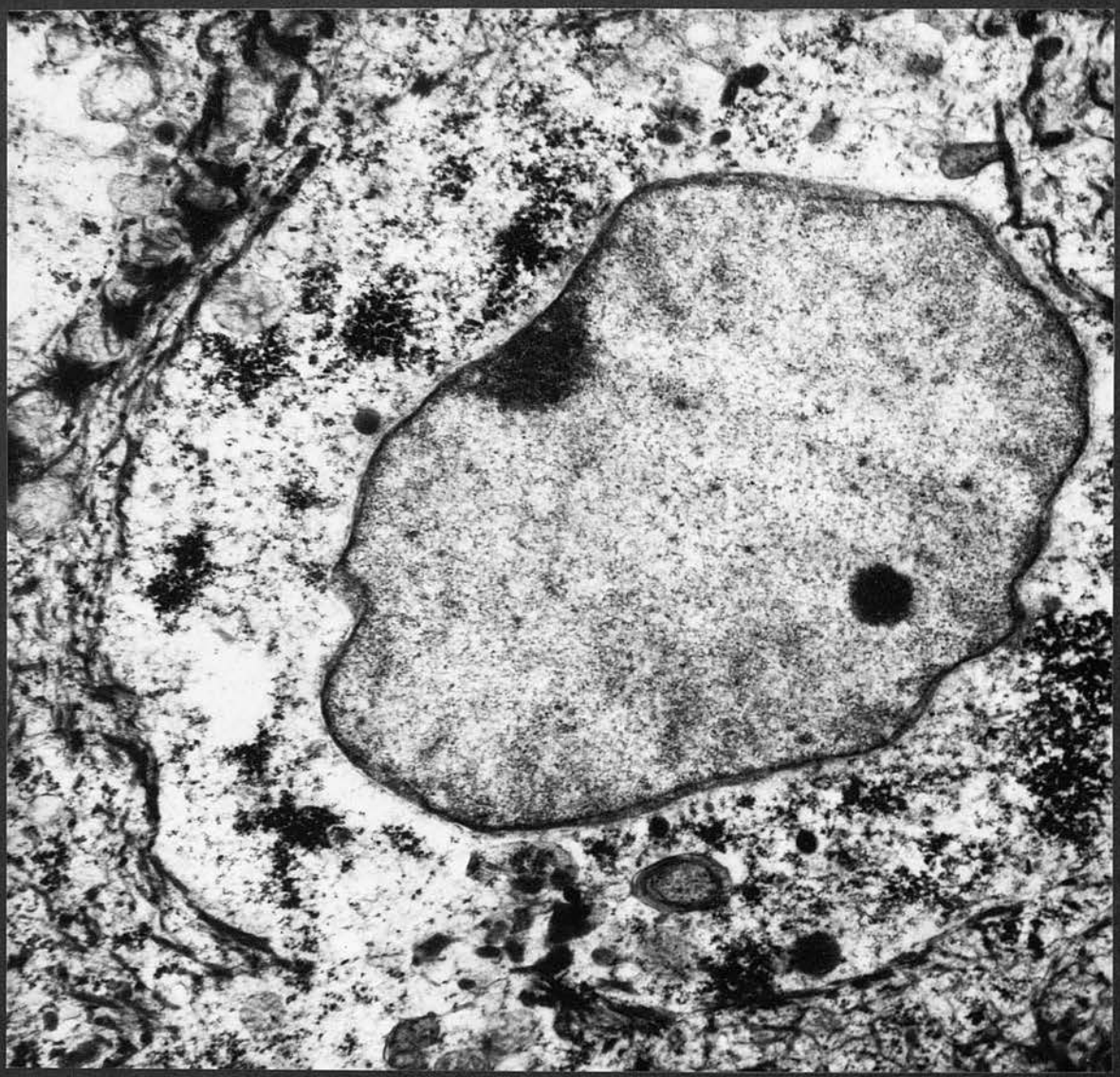


PLATE 26: Electron micrograph of the skin of a susceptible lamb 30 hours after infection with orf virus. Mature and immature virus particles are present either associated with the electron-dense material or free in the cytoplasm. X 10,000

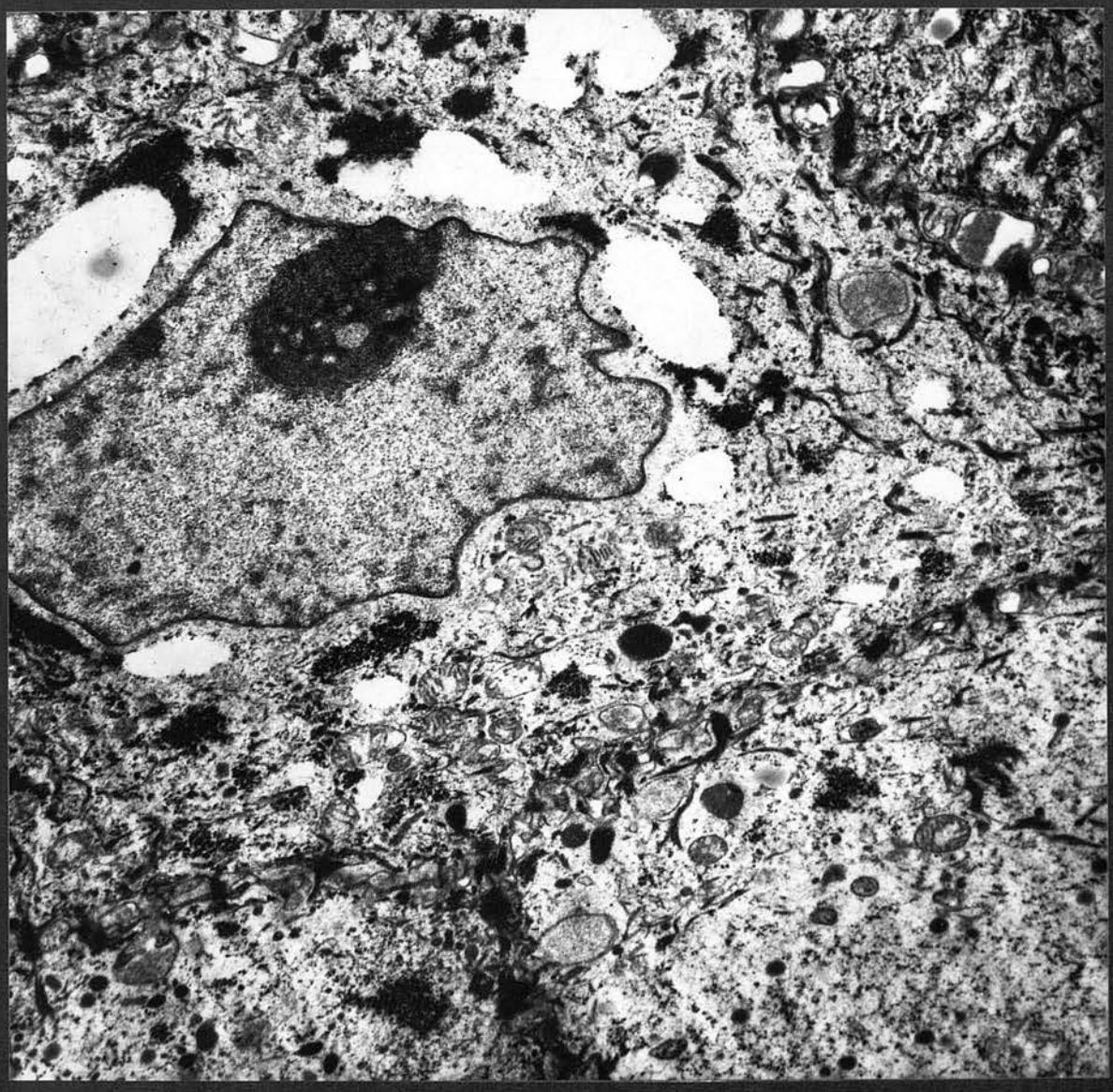


PLATE 27: Electron micrograph of the skin of a susceptible lamb 30 hours after infection with orf virus. Immature orf virus particles characterized by having central electron low-dense cores surrounded by electron-free zones and two outer membranes are present in the cytoplasms of infected cells. The cell constituents are well preserved. X 10,000

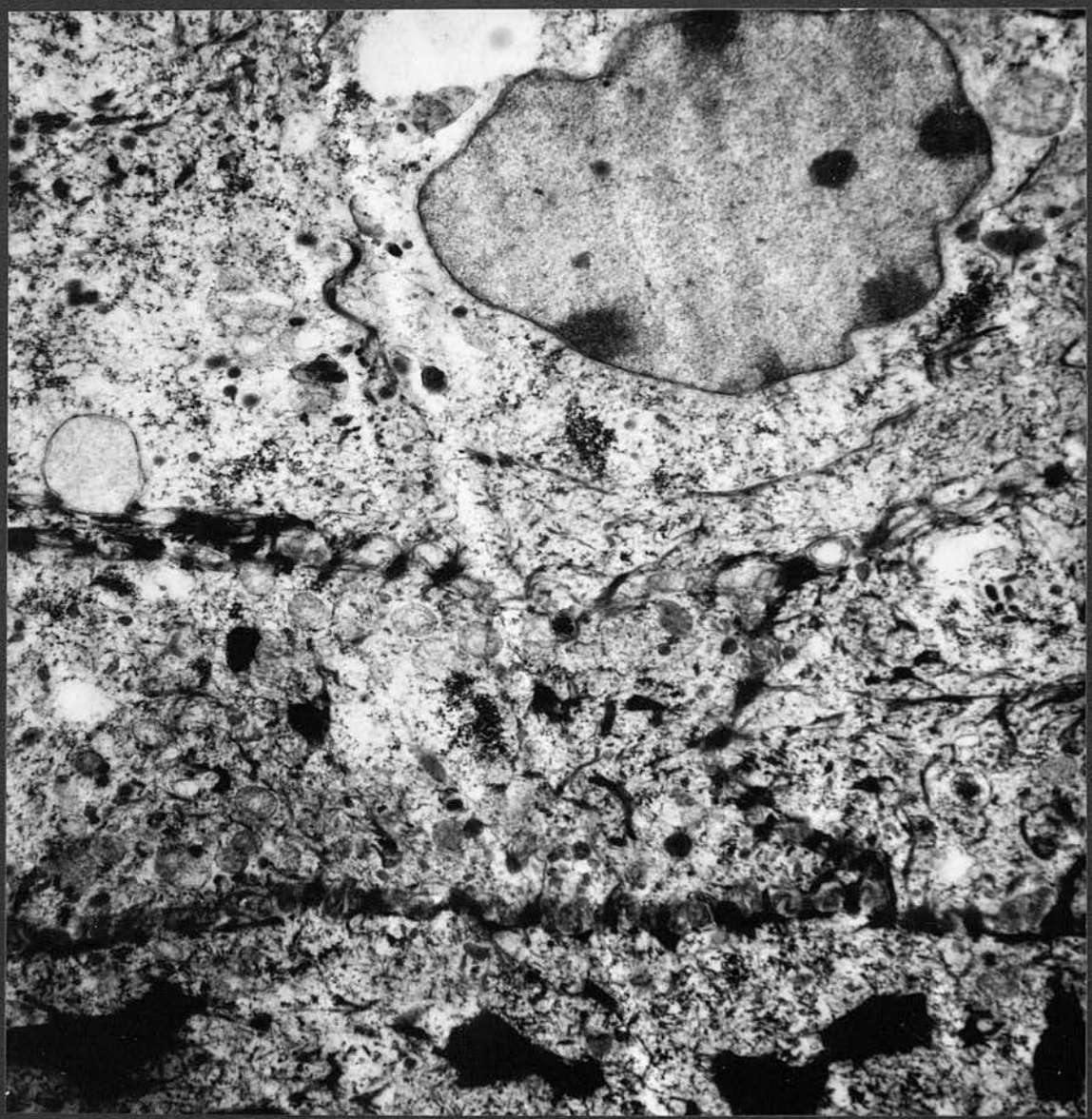


PLATE 28: Electron micrograph of the skin of a susceptible lamb 30 hours after infection with orf virus. The deeper cell layers of the epidermis are free of viral activity. X 6,000

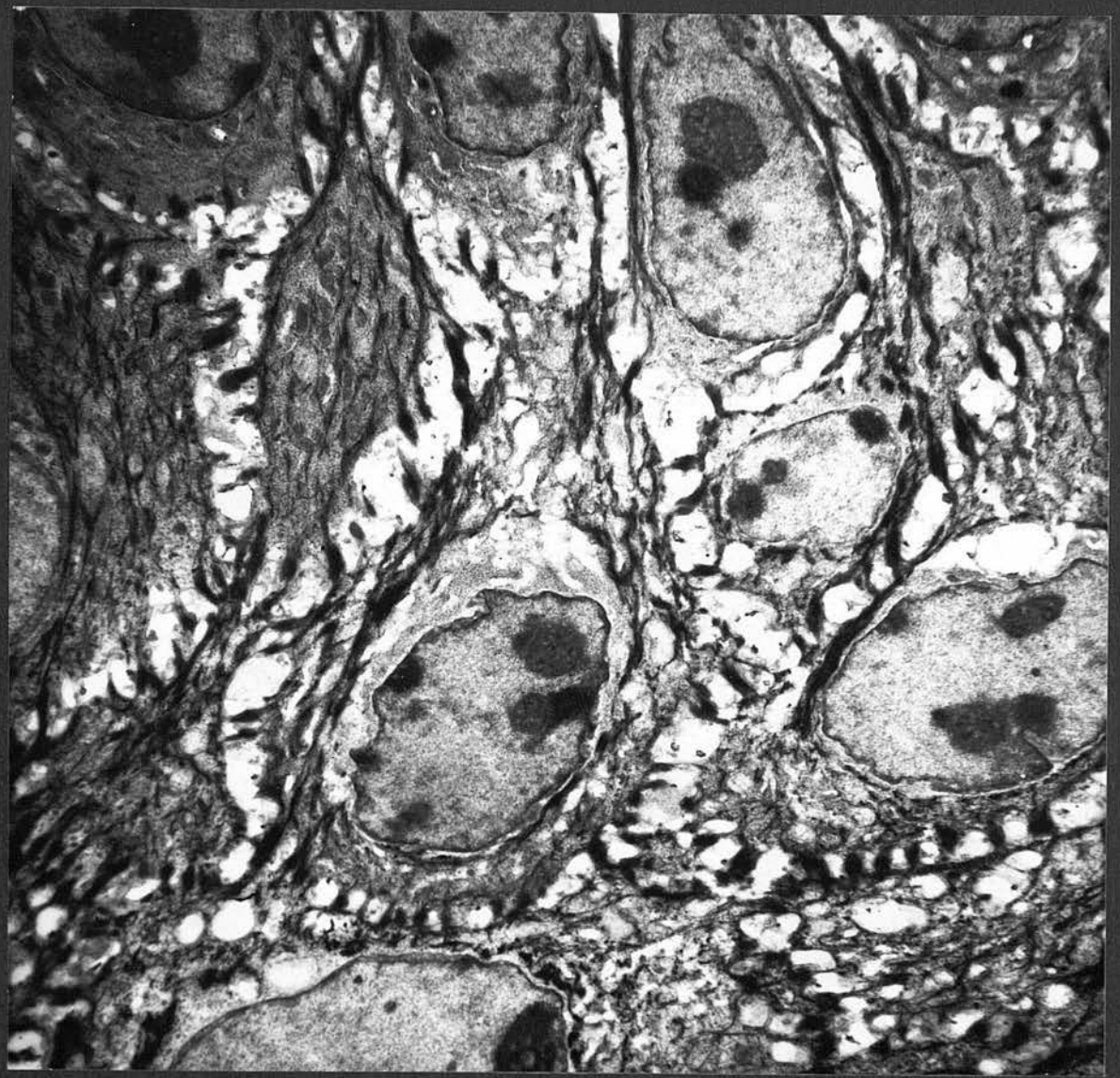


PLATE 29: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. The epidermal cells beneath the skin surface are enlarged and contain, in their cytoplasms, electron-dense aggregates as well as orf virus particles in different stages of development. The infected cells do not contain nuclei. X 6,000

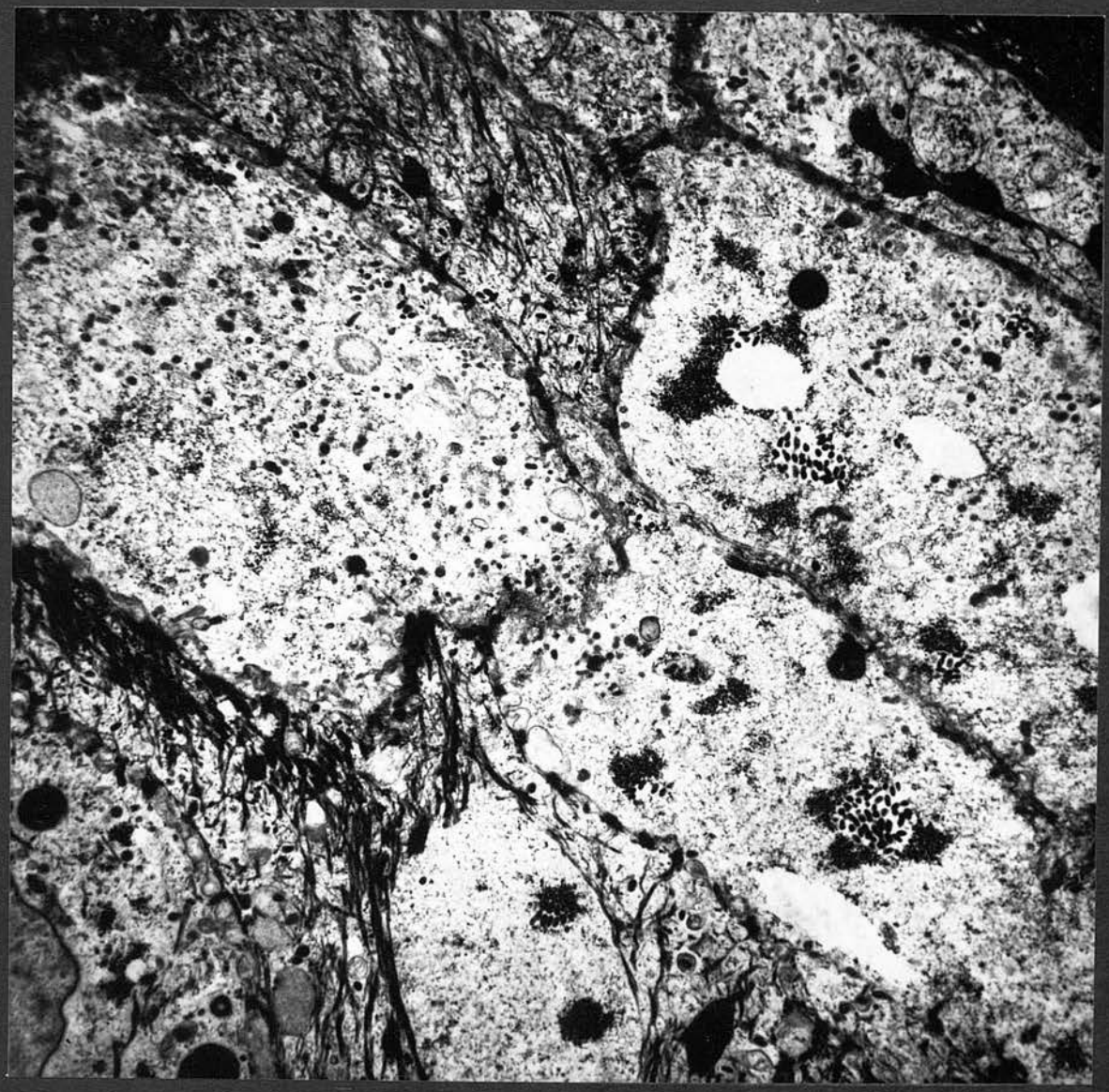


PLATE 30: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. Complete orf virus particles are present either embedded within the electron-dense aggregates or free in the cytoplasms of infected cells. X 15,000

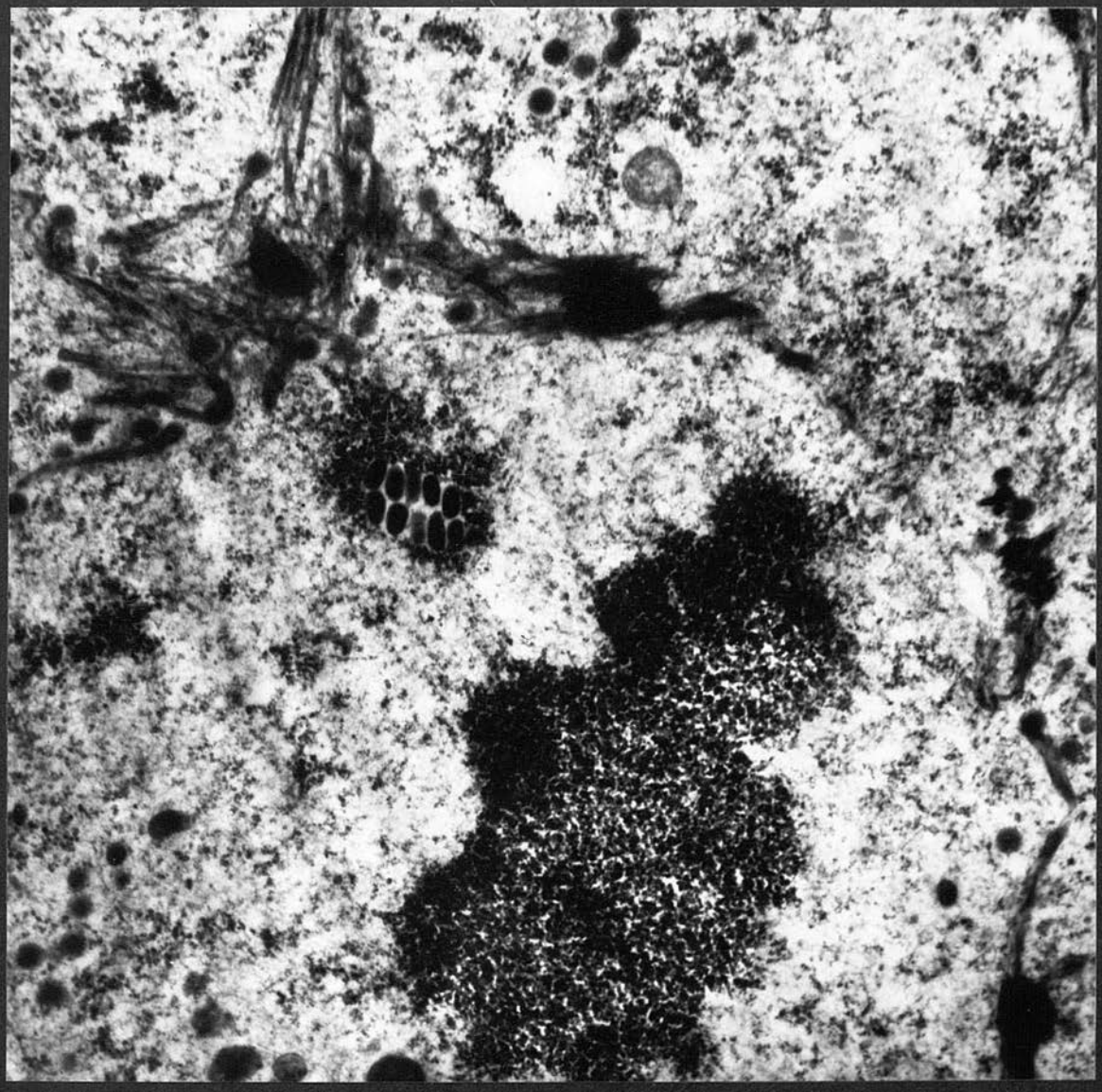


PLATE 31: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. Mature orf virus particles are characterized by having an oval to cylindrical profile with different shaped internal cores.

X 15,000

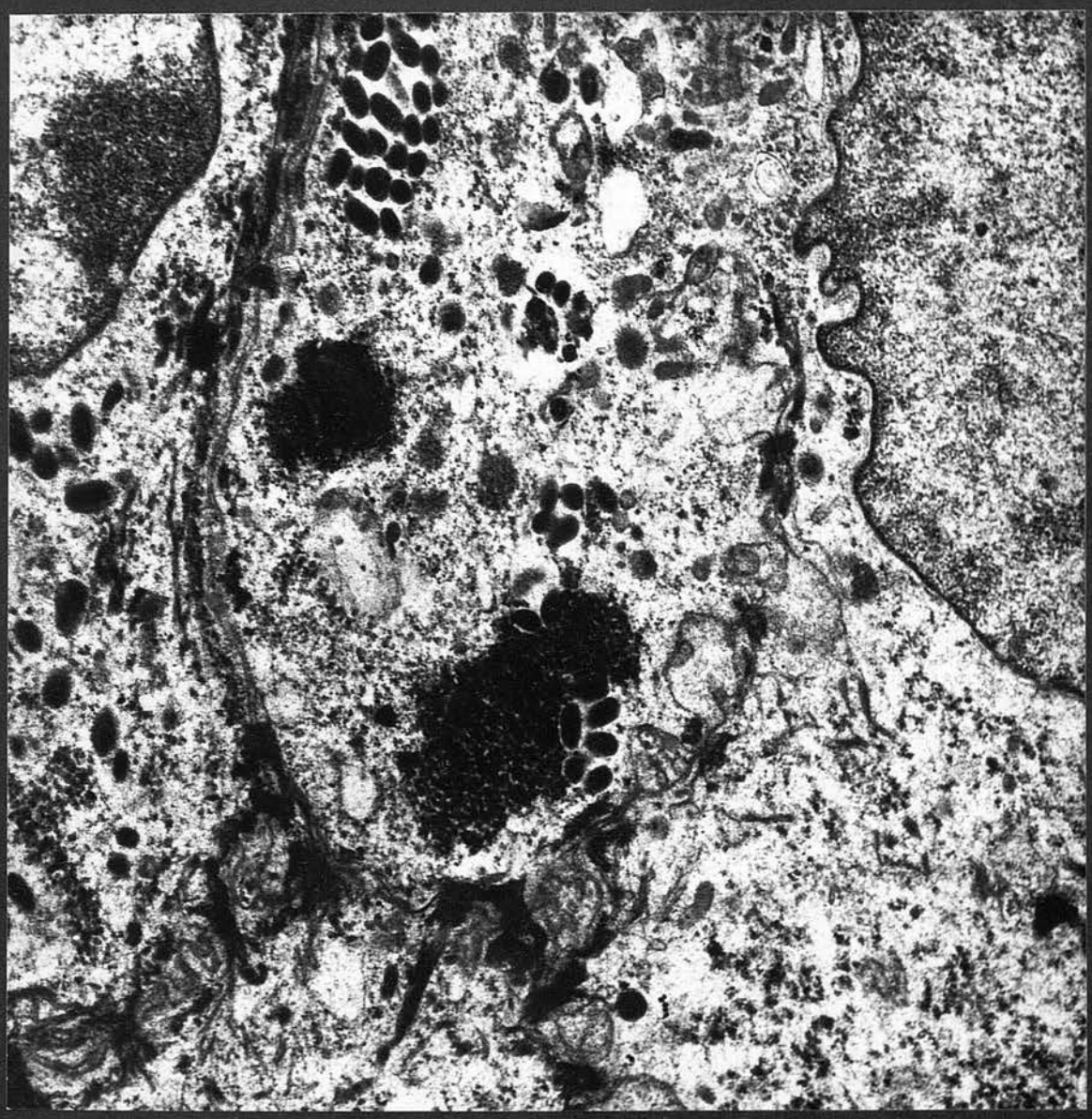


PLATE 32: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. Infected cells show orf virus particles in different stages of maturity in their cytoplasms. x 6,000

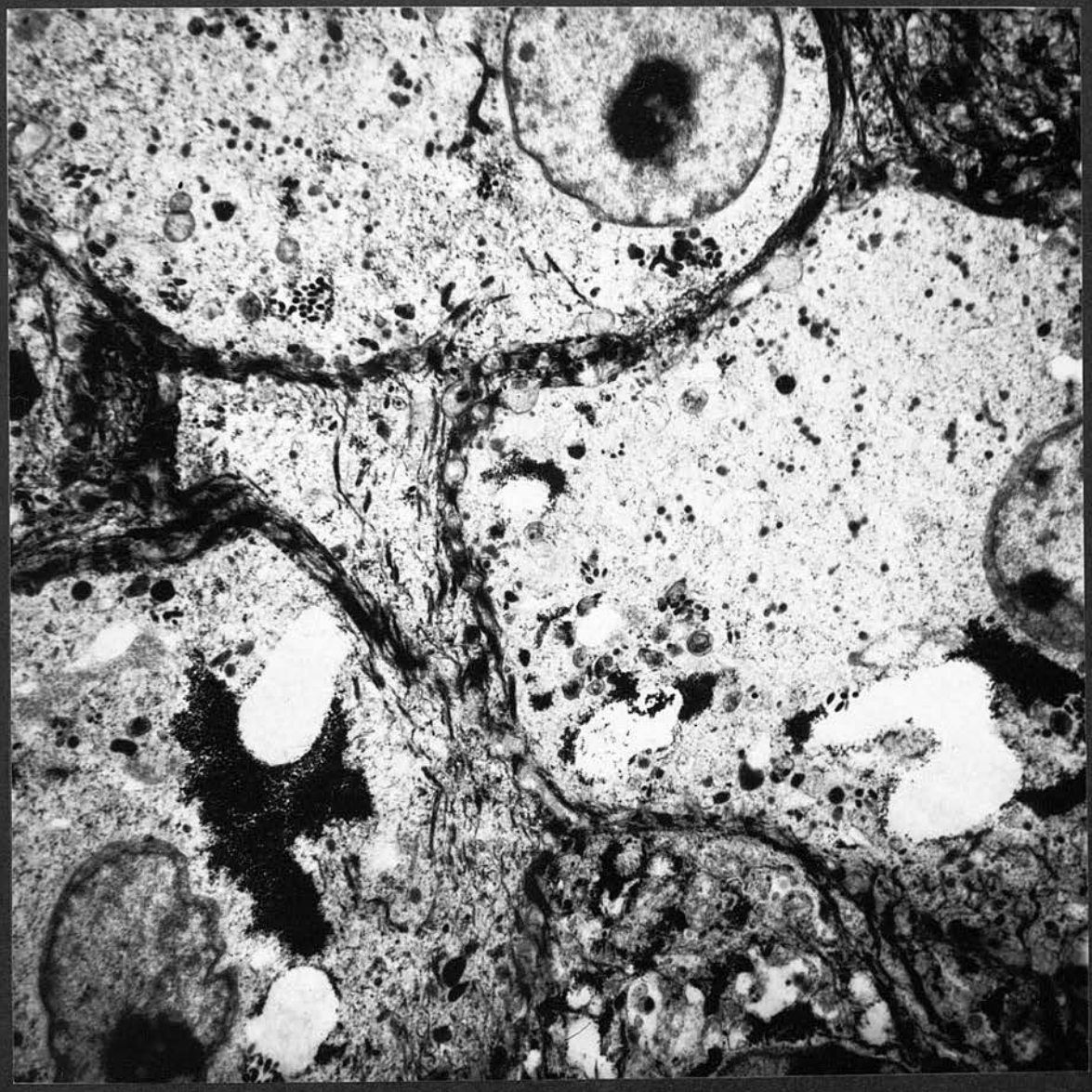


PLATE 33: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. Immature virus particles are present and are associated with viroplasmic matrices. X 6,000

PLATE 34: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. The cytoplasmic organelles of infected cells are relatively well preserved but the ribosomes have apparently increased in number.

X 15,000

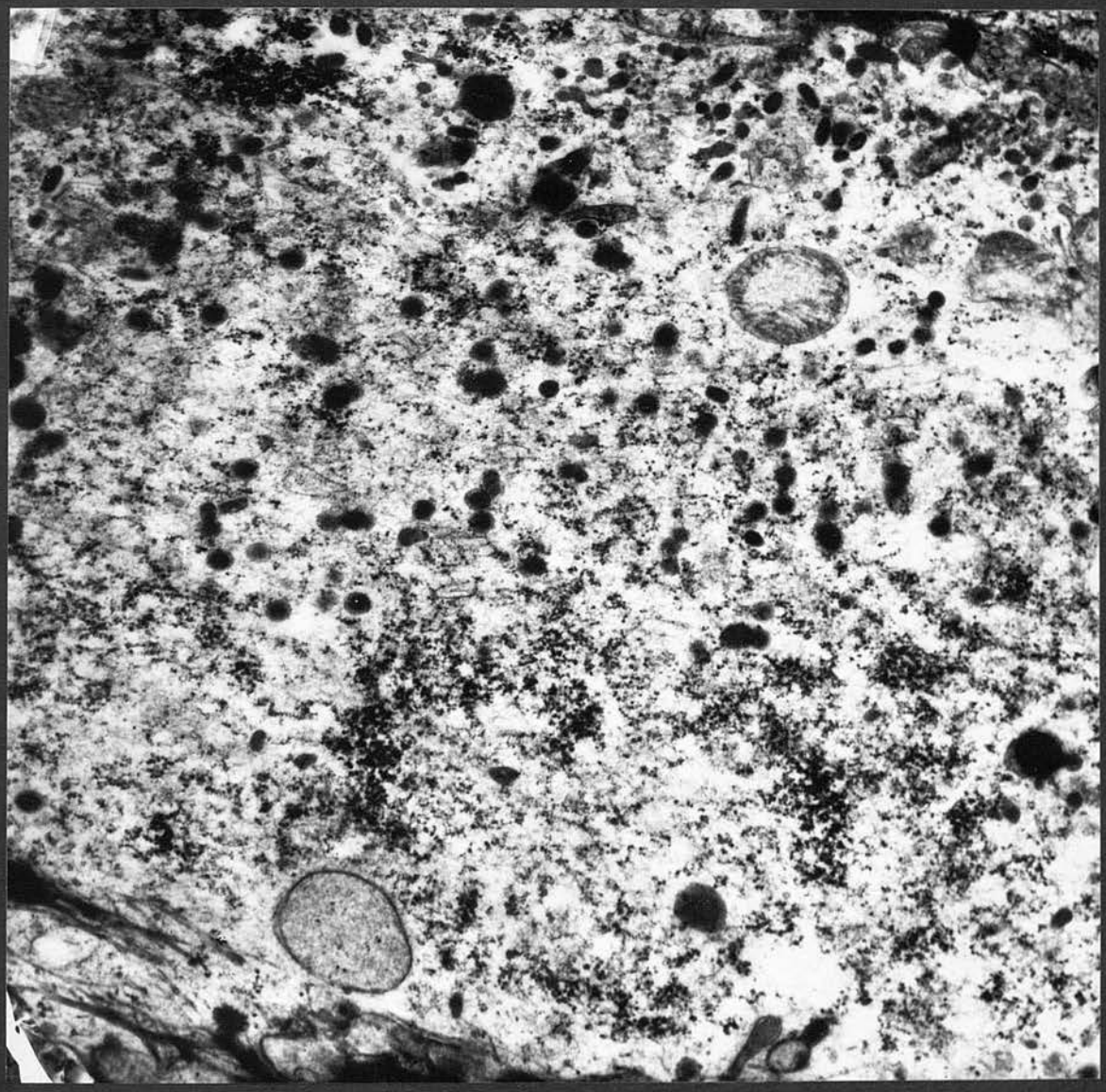


PLATE 36: Electron micrograph of the skin of a susceptible lamb 42 hours after infection with orf virus. The nucleolus of the infected cell is enlarged and appears at the periphery near the nuclear membrane. X 6,000

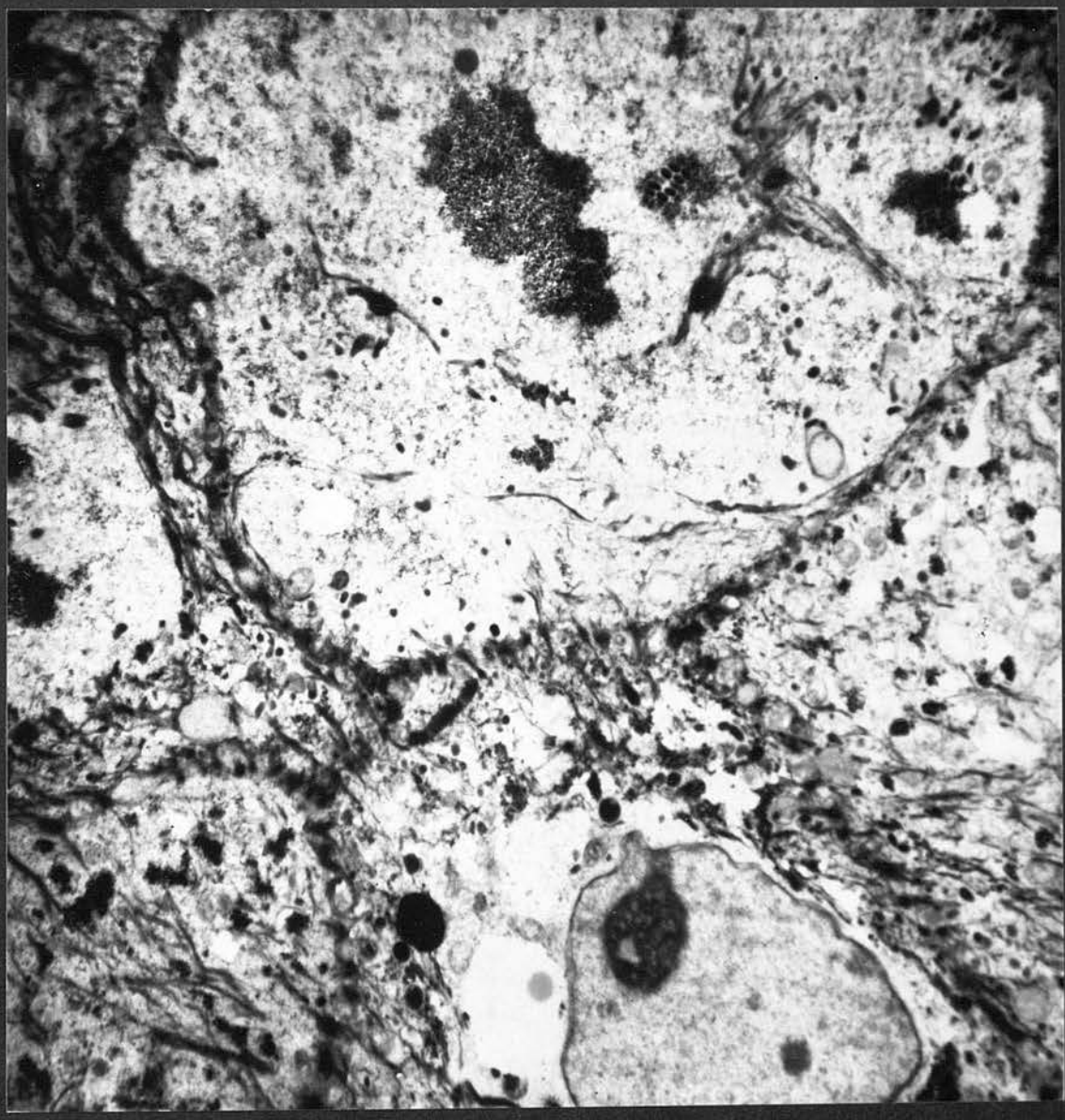


PLATE 37: Electron micrographs of the skin of a susceptible lamb three days after infection with orf virus.

Upper right and left: Numerous orf virus particles in different stages of maturity appear in the epidermal cells located beneath the skin surface. The cytoplamic organelles of these cells are not preserved. X 3,000

Lower right and left: The deeper cells of the epidermis are free of virus activity. X 3,000

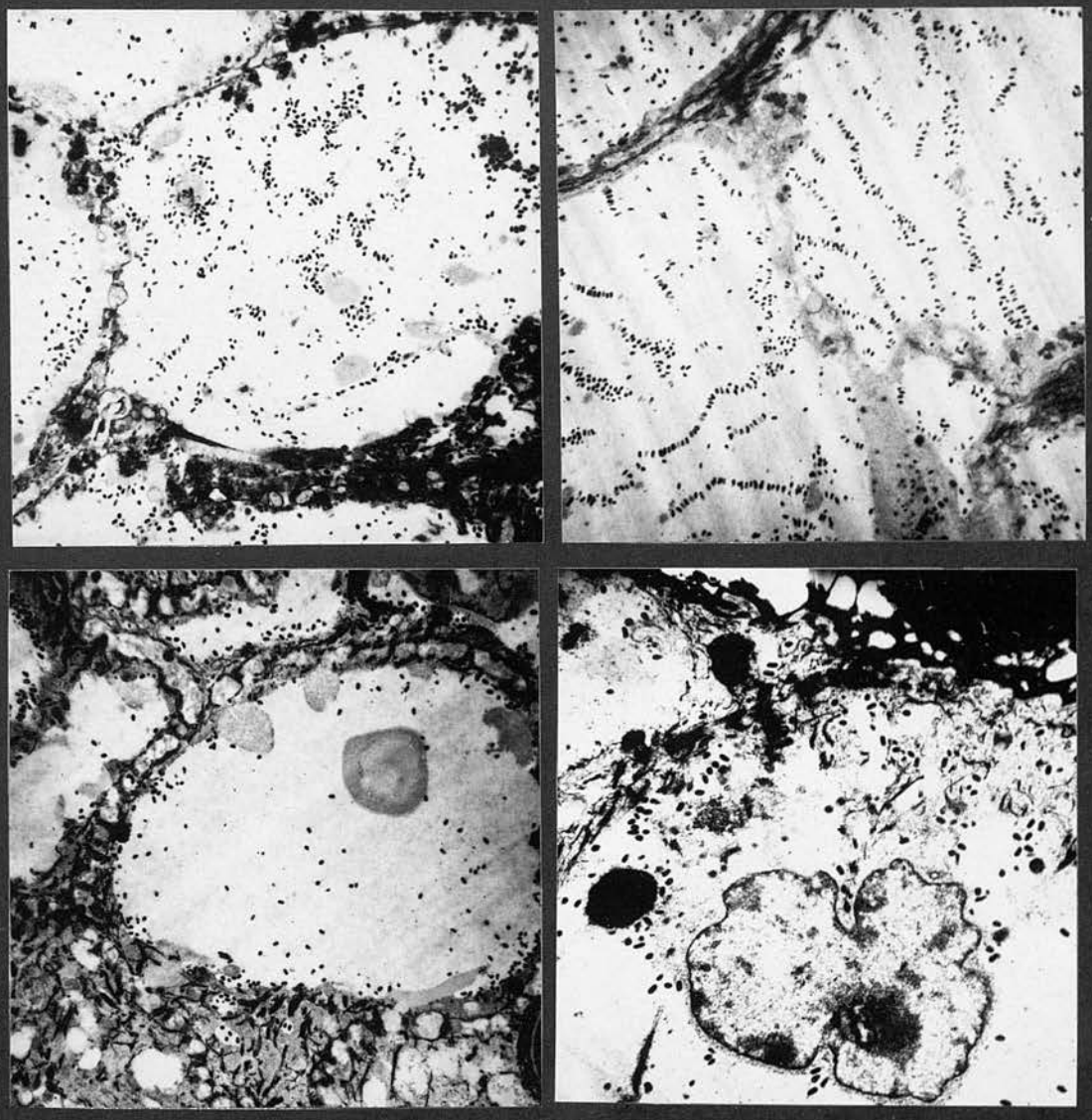
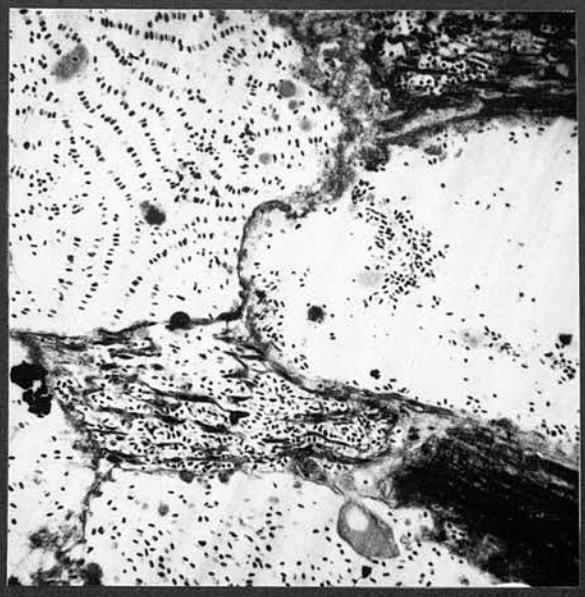


PLATE 39: Electron micrographs of the skin of a susceptible lamb three days after infection with orf virus.

Upper and lower: Orf virus particles are present extracellularly as well as intracellularly.

X 3,000



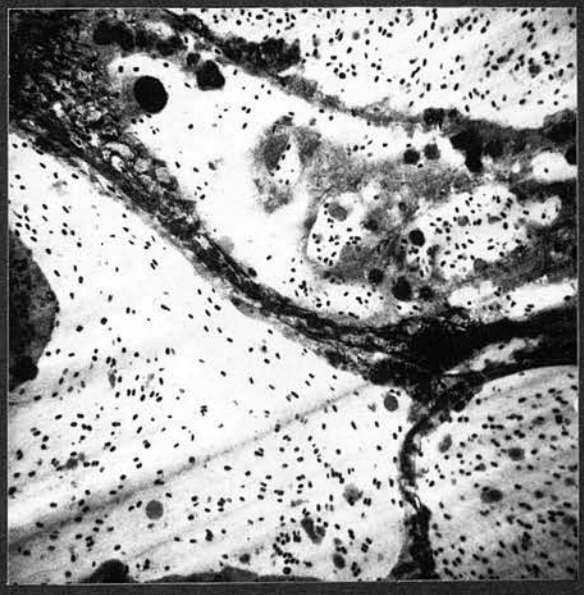


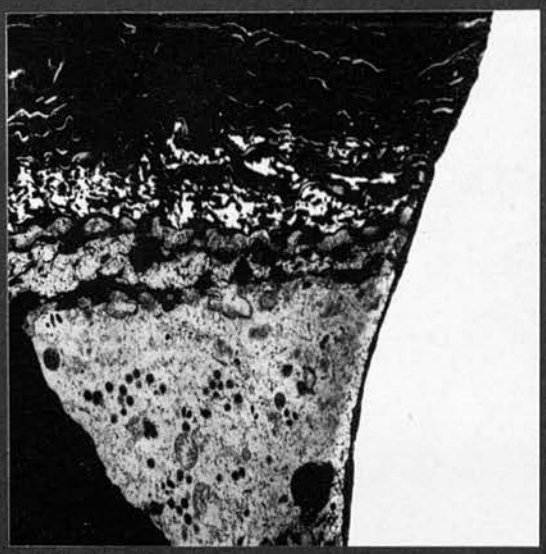
PLATE 40: Electron micrographs of the skin of a susceptible lamb three days after infection with orf virus. Early degenerated cells show virus particles in different stages of maturity in their cytoplasms. The cytoplasmic constituents of the infected cells are relatively well preserved.

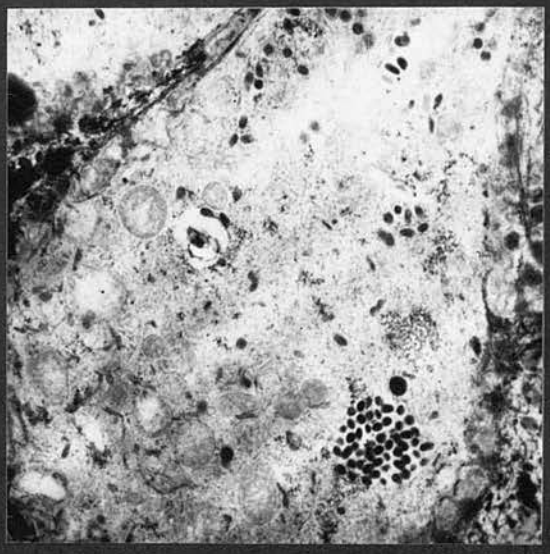
Upper right X 5,000

Upper left X 7,500

Lower right X 7,500

Lower left X 7,500





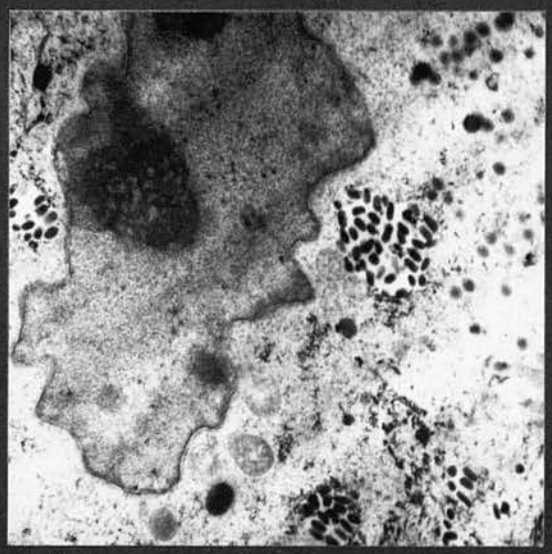
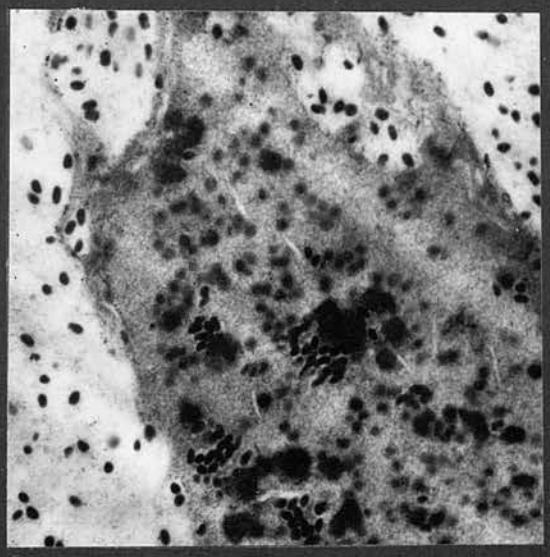


PLATE 41: Electron micrographs of the skin of a susceptible lamb three days after infection with orf virus. Immature virus particles are present either free in the cytoplasms of infected cells or associated with dense viroplasmic matrices.

Upper	X 7,500
Middle	X 3,000
Lower	X 5,000



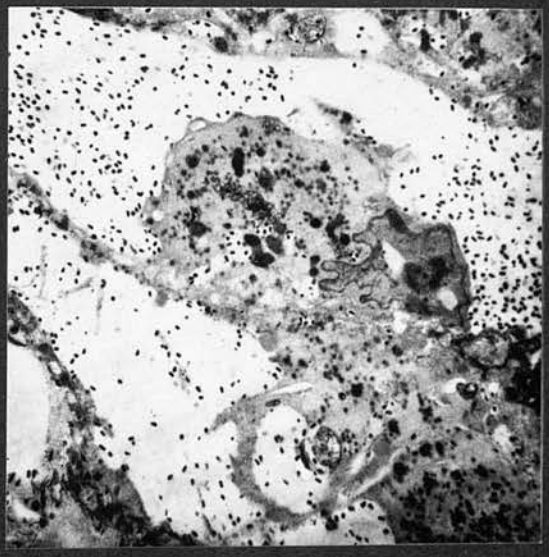


PLATE 42: Electron micrograph of the skin of a susceptible lamb three days after infection with orf virus. Great numbers of "shells" either empty or containing low electron-dense granular material are present within the dense viroplasmic matrices. X 20,000

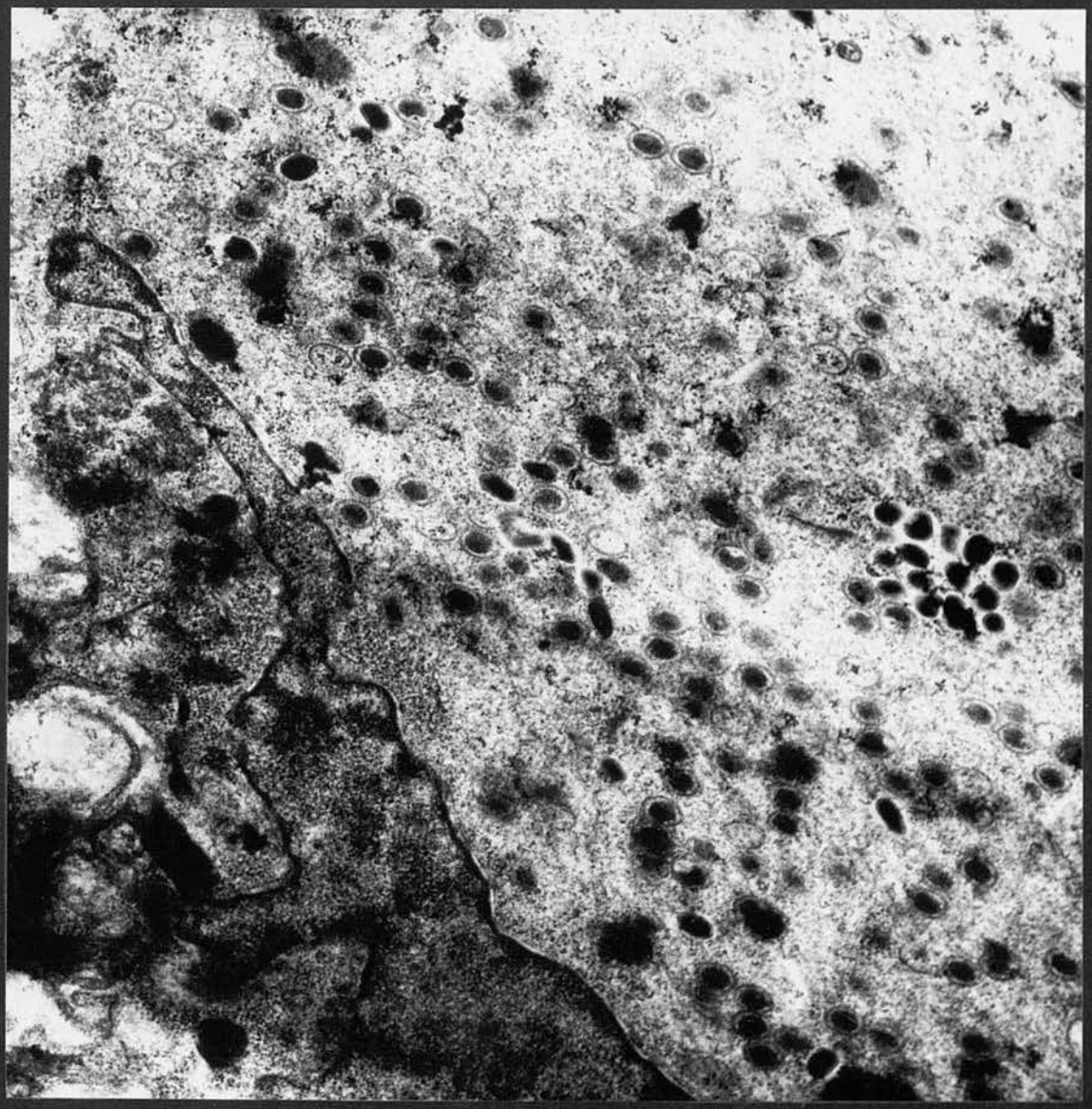


PLATE 43: Electron micrograph of the skin of a susceptible lamb three days after infection with orf virus. Mature virus particles are present close to or surrounding the dense viroplasmic matrix. × 60,000

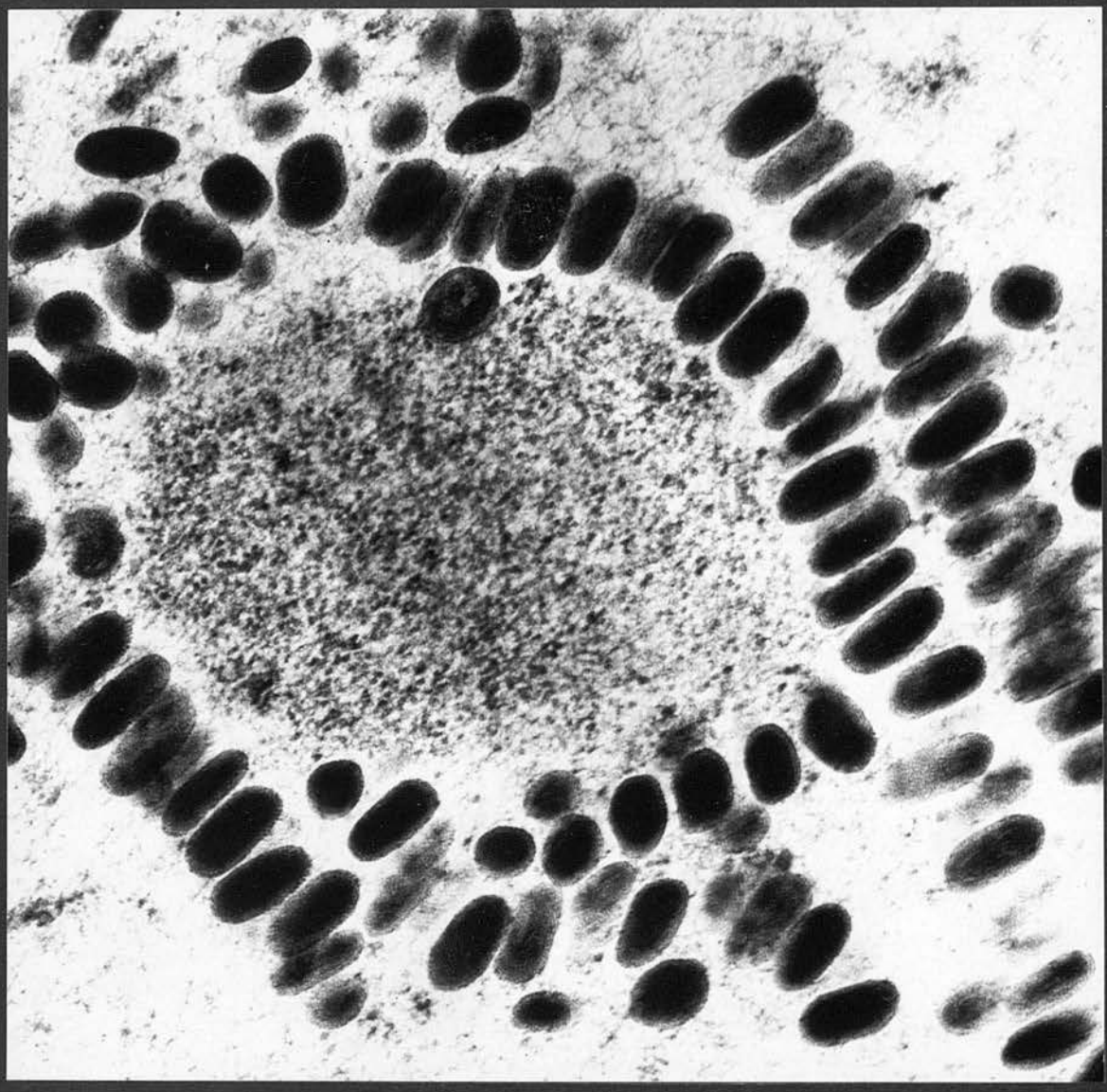


PLATE 44: Electron micrograph of the skin of a susceptible lamb three days after infection with orf virus. A few vacuoles either empty or containing virus particles are present intracellularly and extracellularly. X 6,000

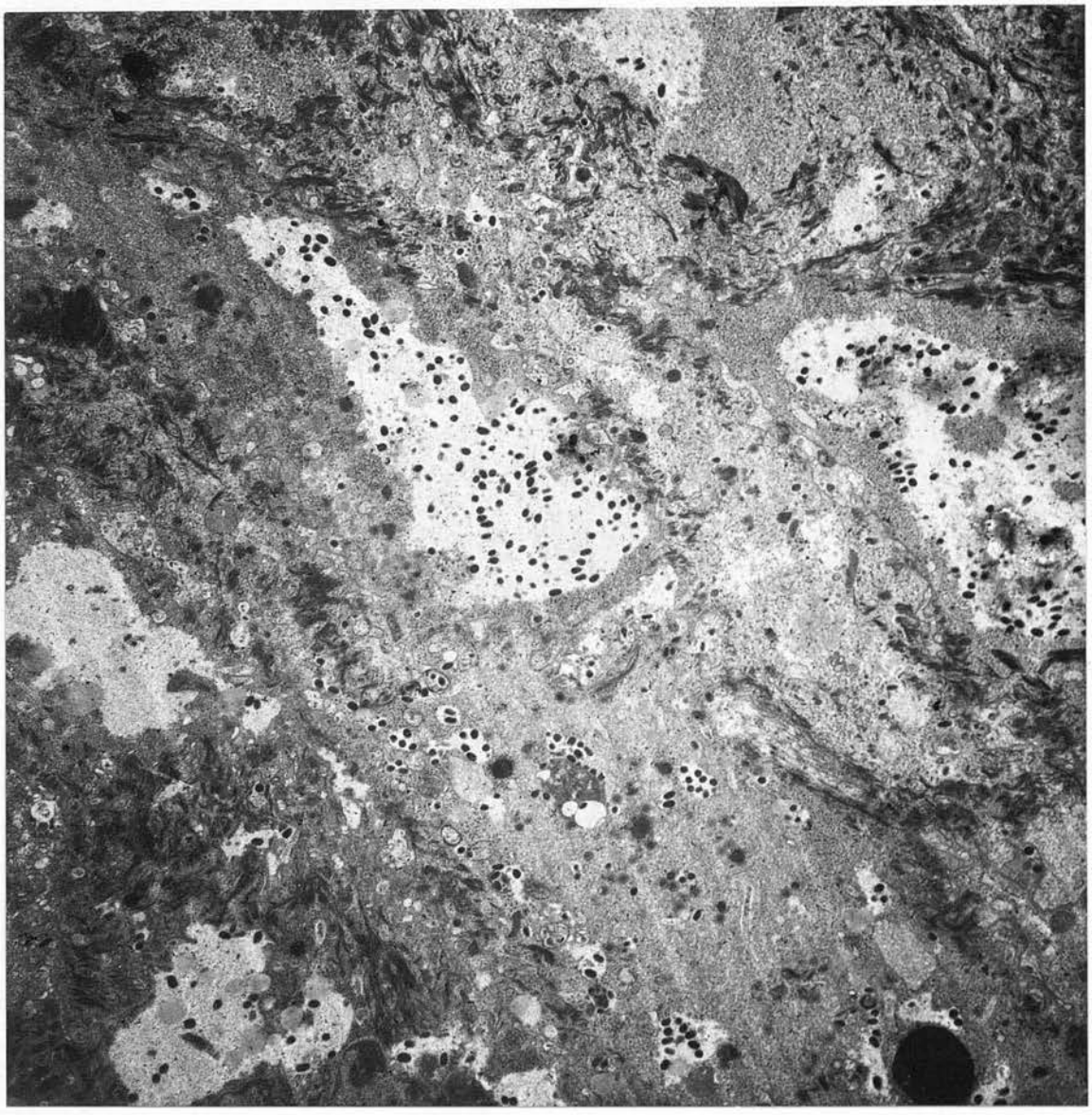


PLATE 45: Electron micrograph of the skin of a susceptible lamb four days after infection with orf virus. Most of the epidermal layers are involved and contain numerous virus particles.

X 20,000

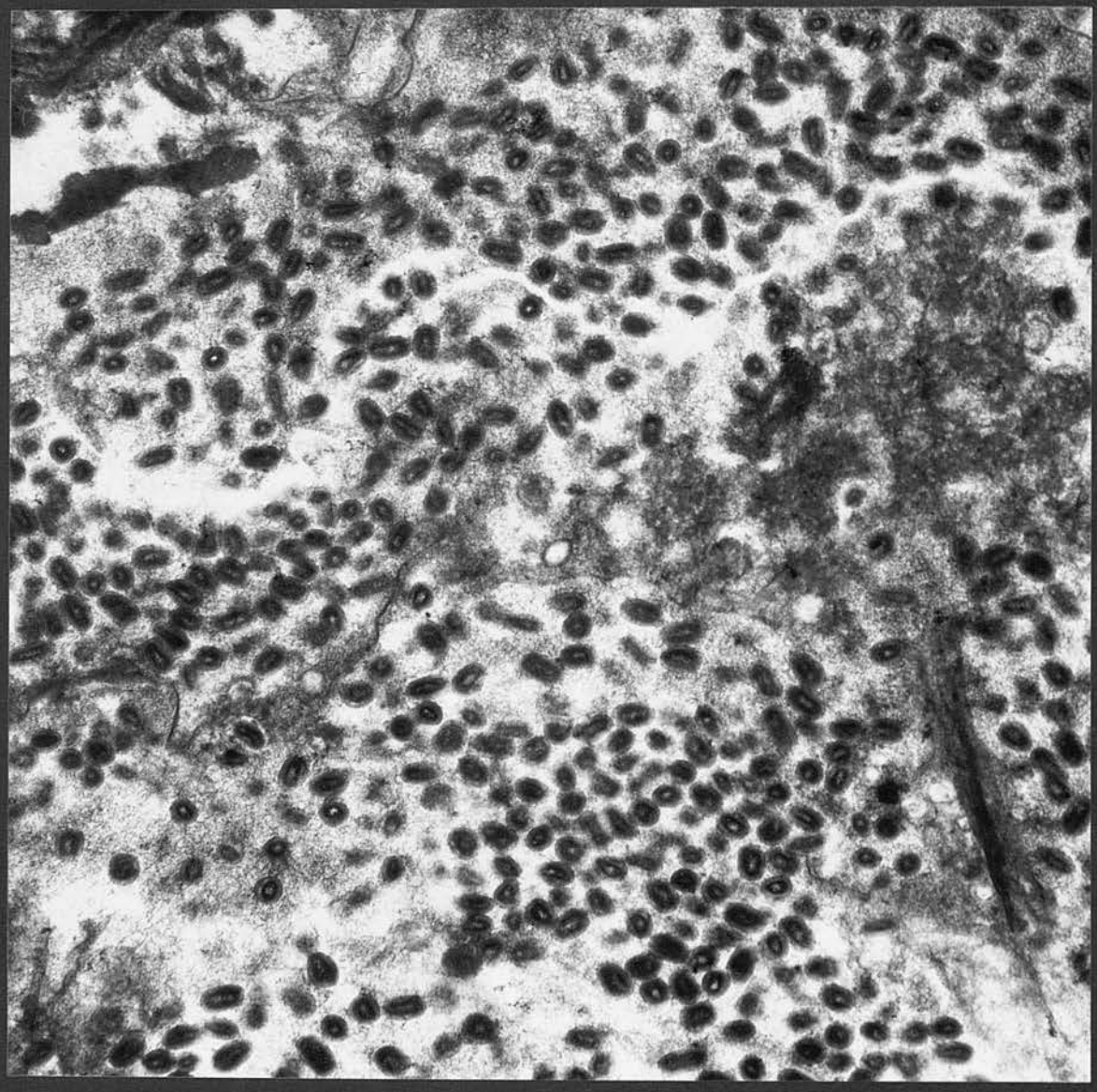


PLATE 46: Electron micrograph of the skin of a susceptible lamb four days after infection with orf virus. Complete virus particles appear extracellularly as well as intracellularly.

X 6,000

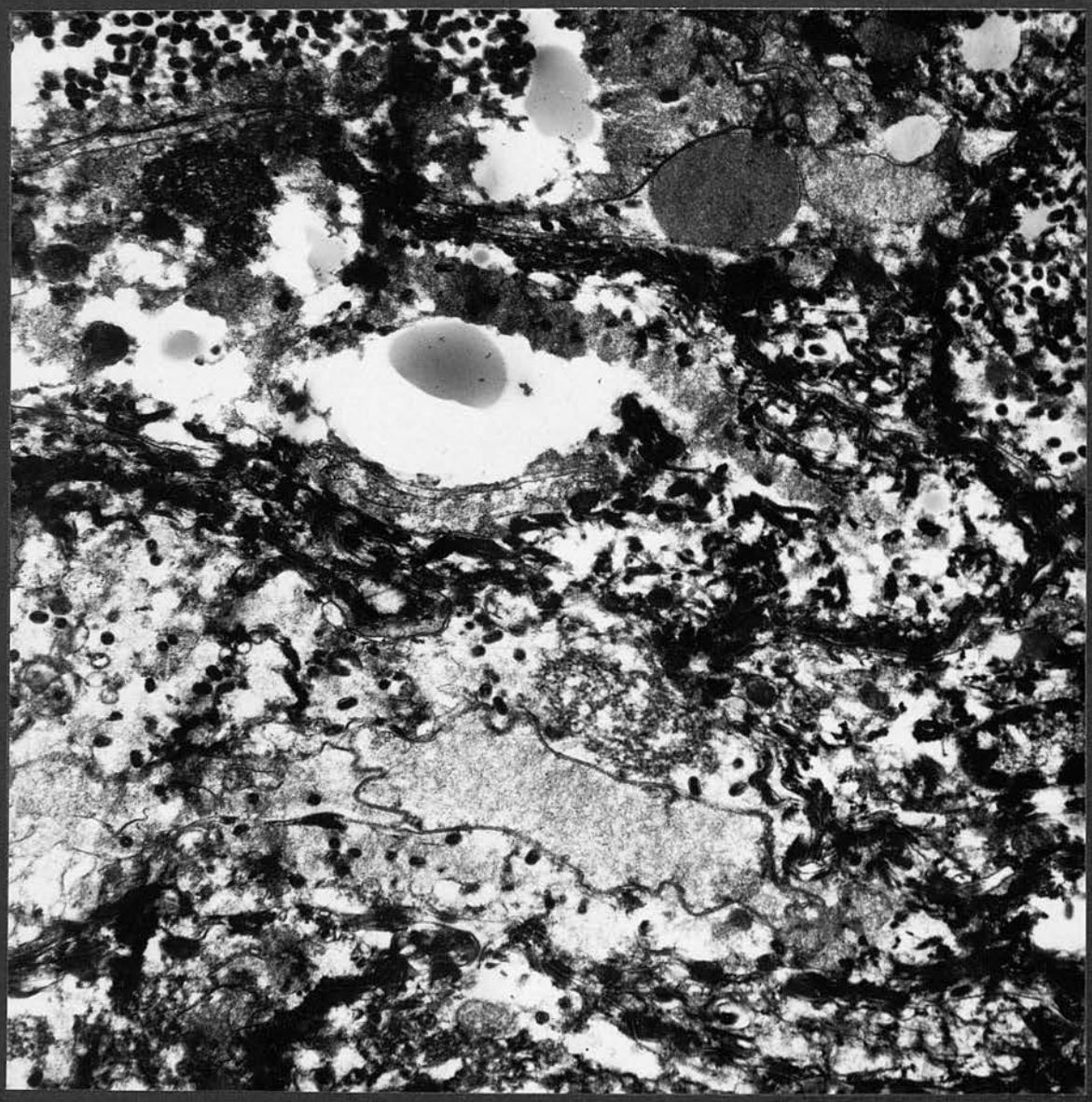


PLATE 47: Electron micrograph of the skin of a susceptible lamb four days after infection with orf virus. A few complete virus particles are present over a well preserved nucleus. X 15,000

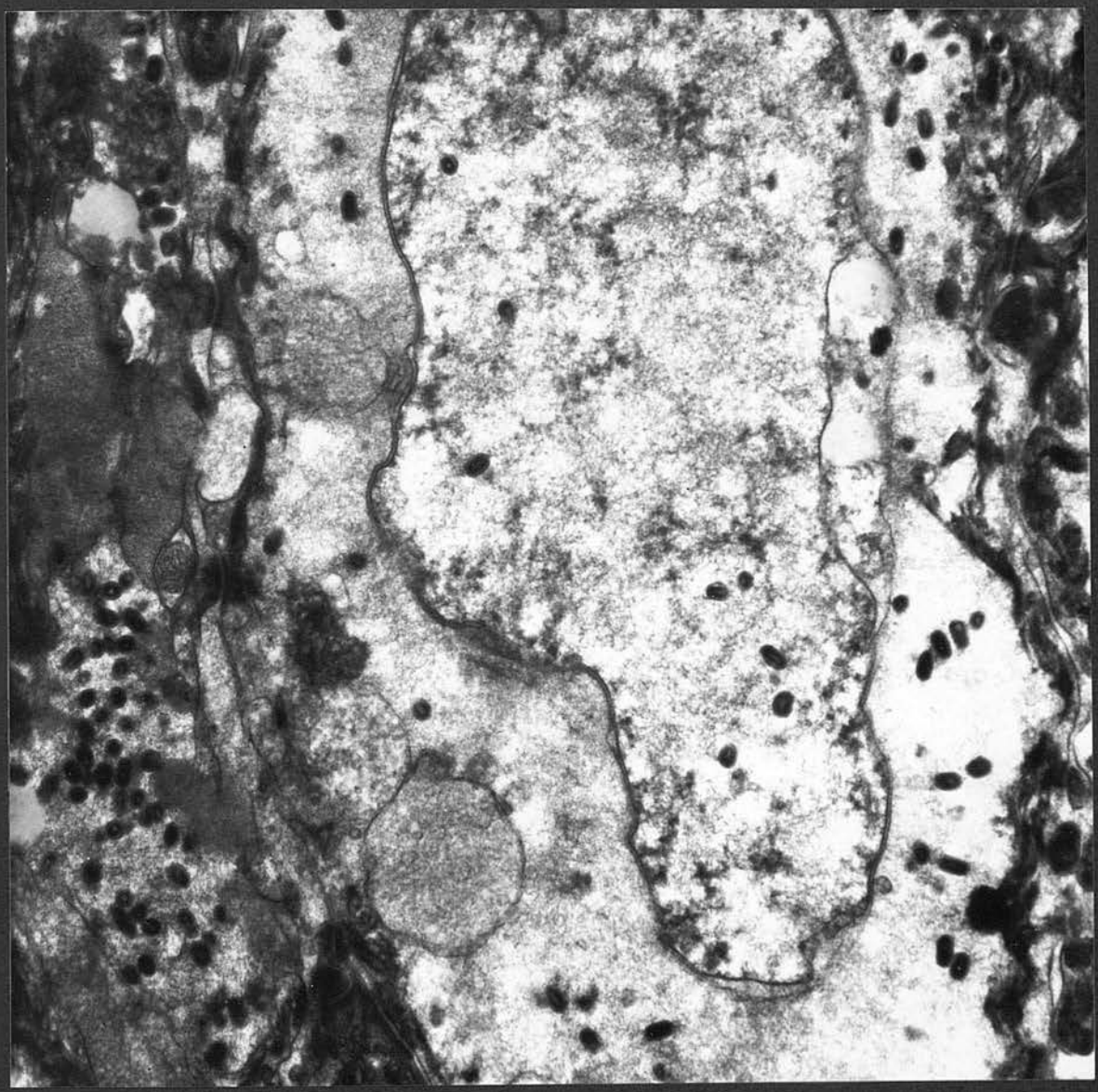


PLATE 48: Electron micrographs of the skin of a susceptible lamb five, six, eight and ten days after infection with orf virus.

Upper right: From susceptible lamb infected five days. X 3,000

Upper left: From susceptible lamb infected six days. X 5,000

Lower right: From susceptible lamb infected eight days. X 7,500

Lower left: From susceptible lamb infected ten days. X 5,000

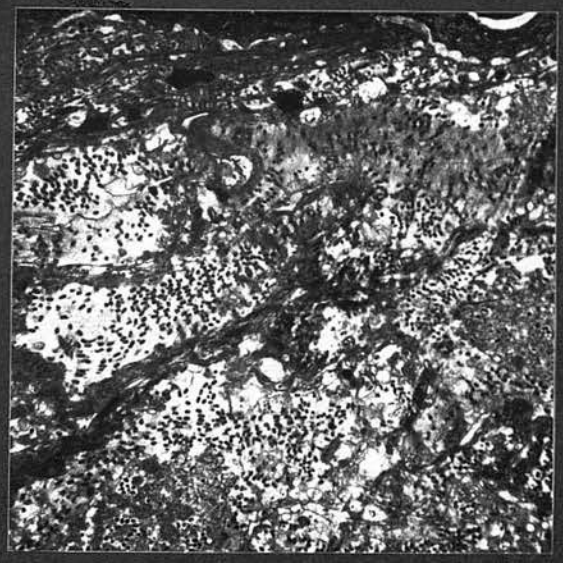


PLATE 49: Electron micrograph of the skin of a susceptible lamb six days after infection with orf virus. Numerous virus particles appear intracellularly and extracellularly. X 10,000

PLATE 50: Electron micrograph of the skin of a susceptible lamb six days after infection with orf virus. Immature virus particles are still evident. × 6,000

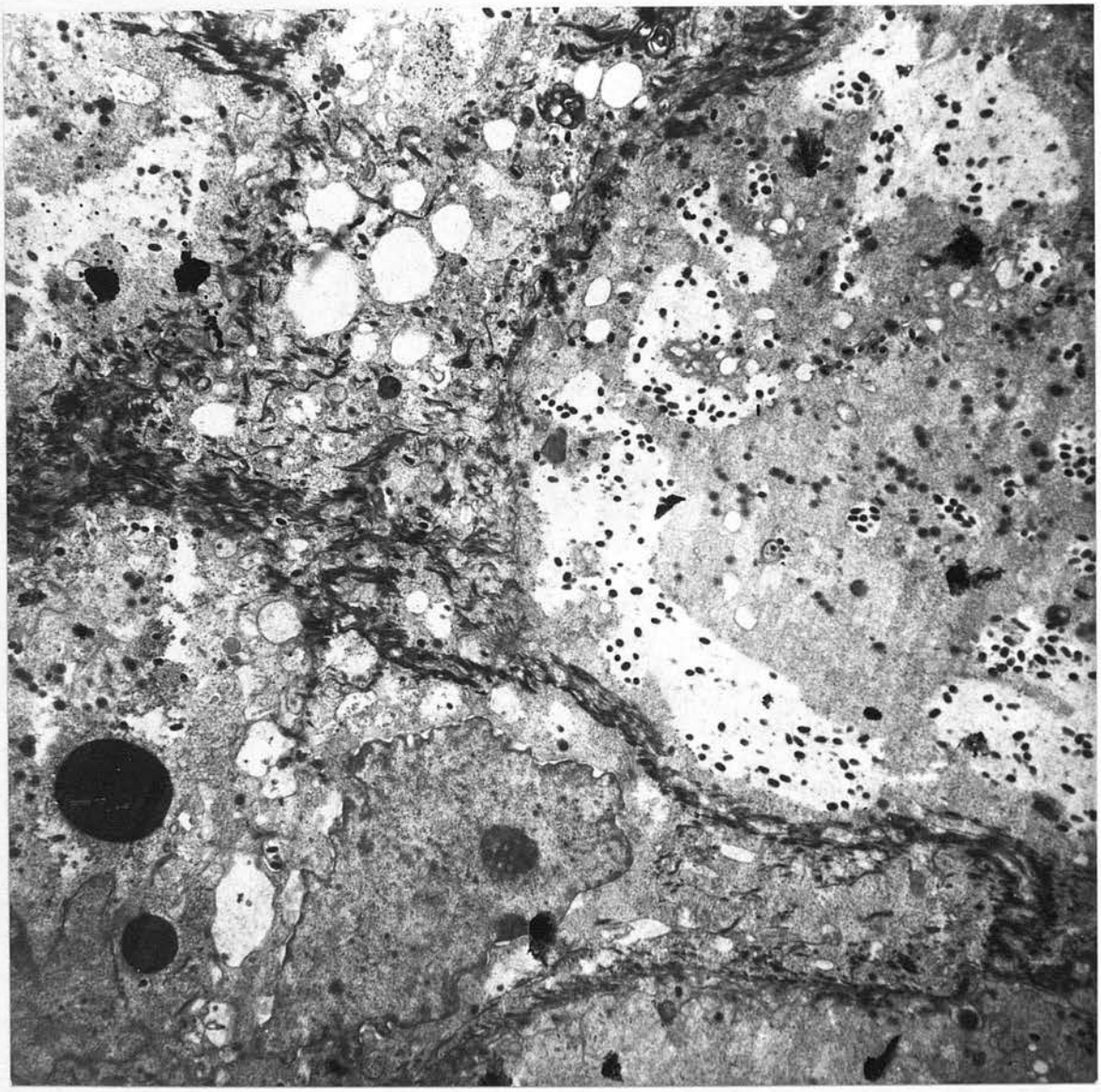


PLATE 51: Electron micrograph of the skin of a susceptible lamb 10 days after infection with orf virus. Immature virus particles as well as mature virus particles are present in the cells.

x 6,000

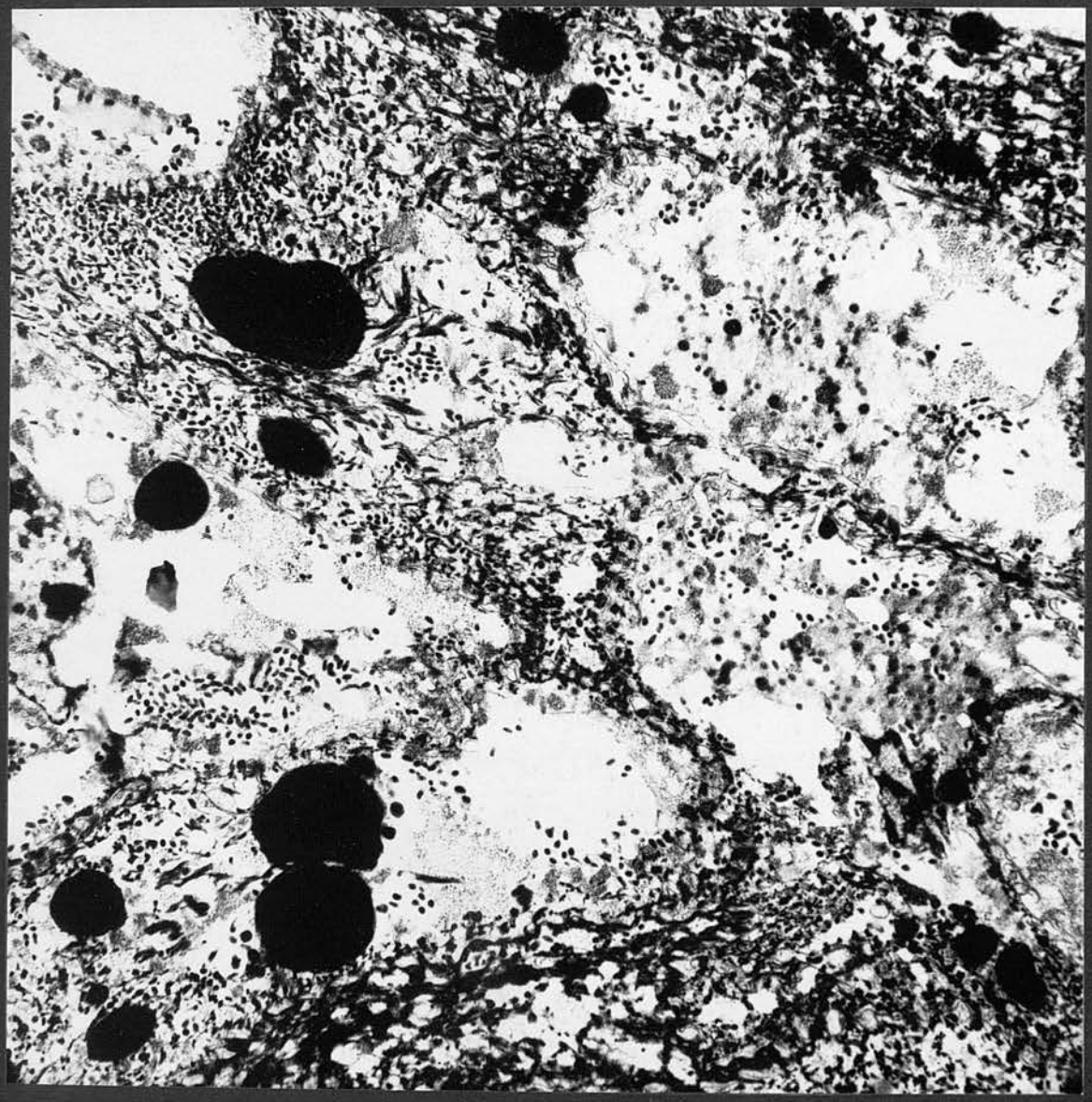


PLATE 52: Electron micrograph of the skin of a susceptible lamb 10 days after infection with orf virus. A few infected cells contain a nucleus which is characterized by the smaller size and highly degenerated state.

X 6,000

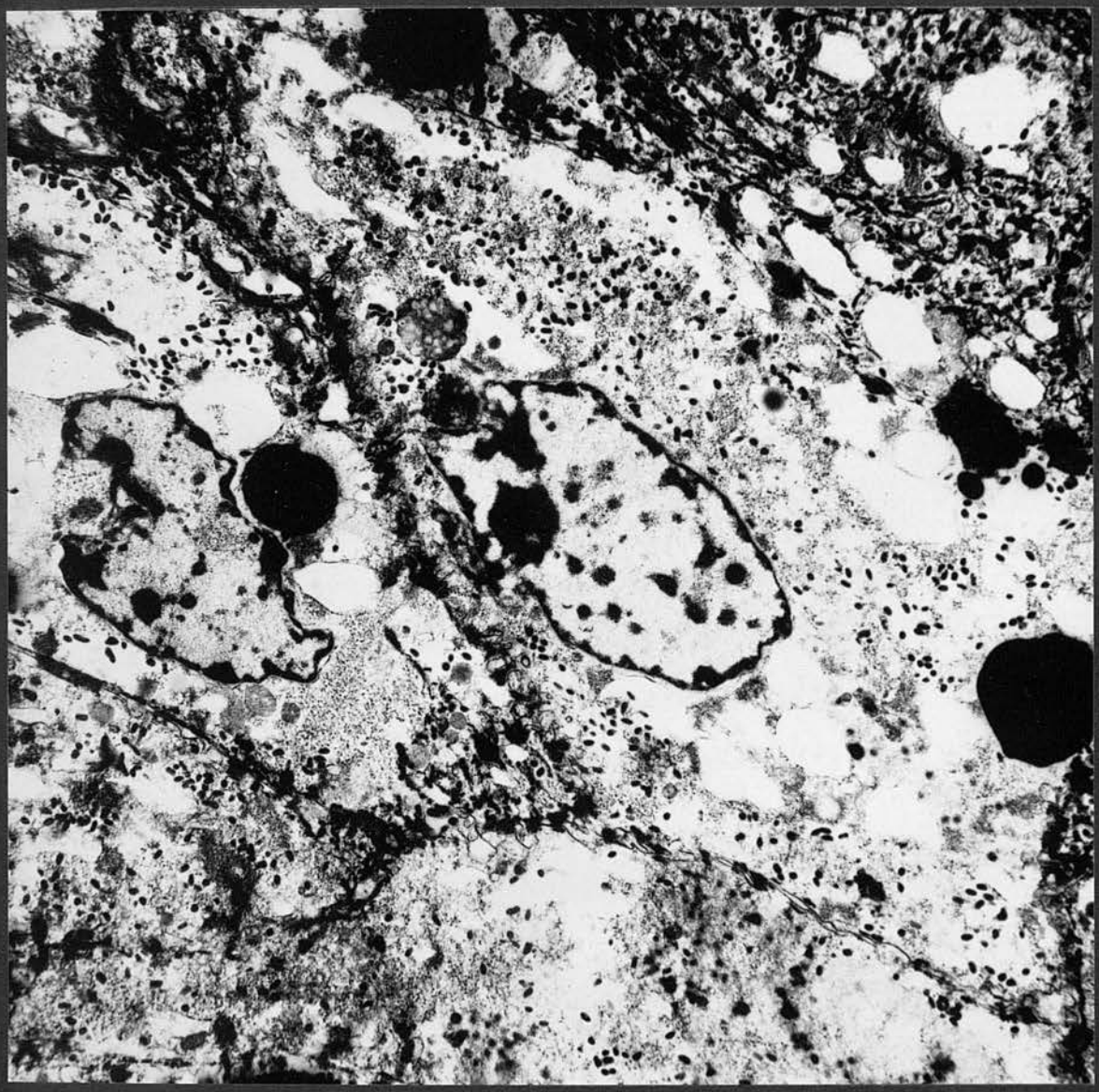


PLATE 53: Electron micrograph of the skin of a susceptible lamb 14 days after infection with orf virus. Orf virus particles are present in the uppermost cells of the epidermis.

x 6,000

PLATE 54: Electron micrograph of the skin of a susceptible lamb 15 days after infection with orf virus. Complete virus particles are few in number and occur directly beneath the skin surface.

x 10,000

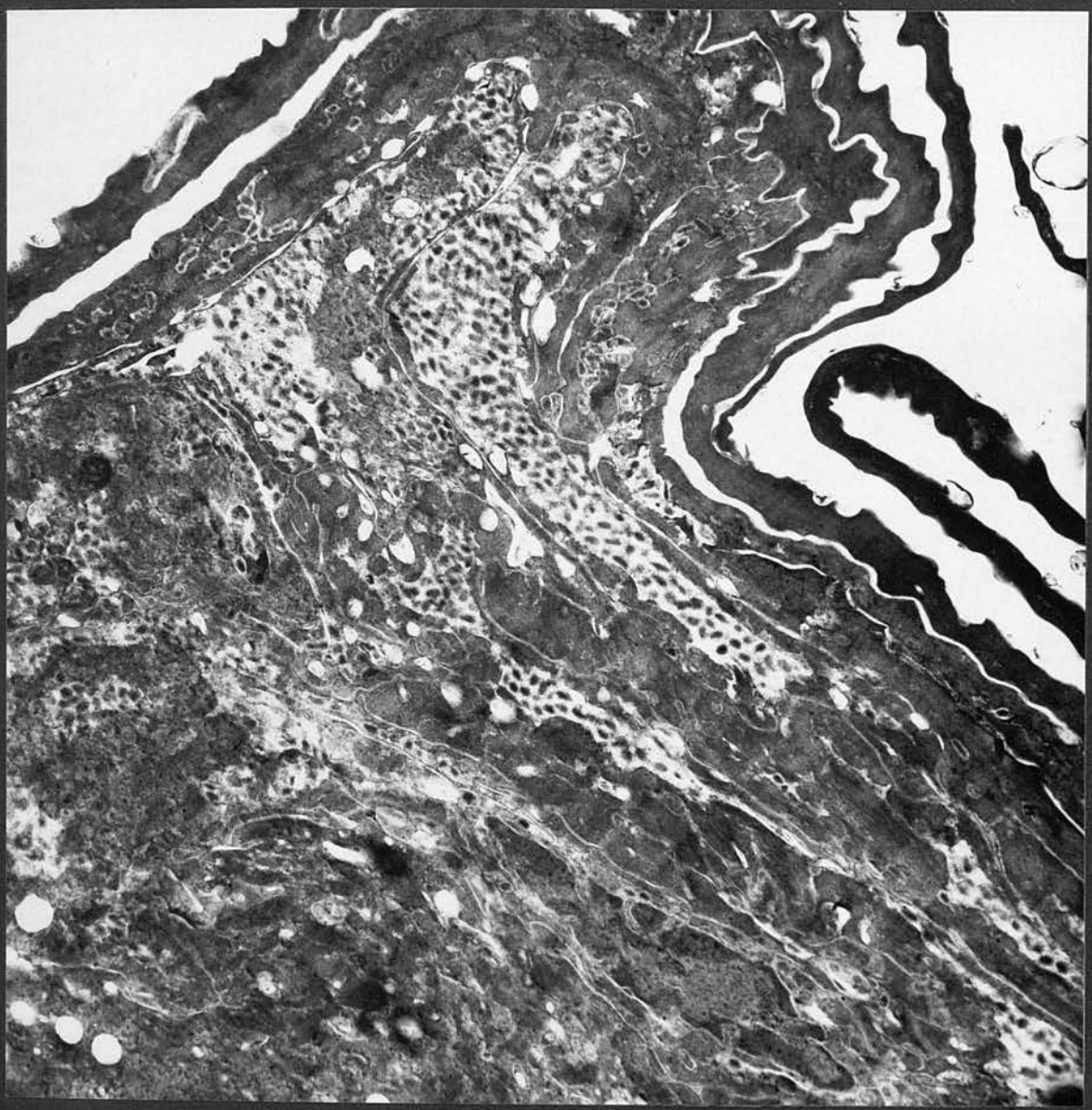


PLATE 55: Electron micrograph of the skin of a susceptible lamb 17 days after infection with orf virus. Very few complete virus particles are present near the skin surface. X 20,000

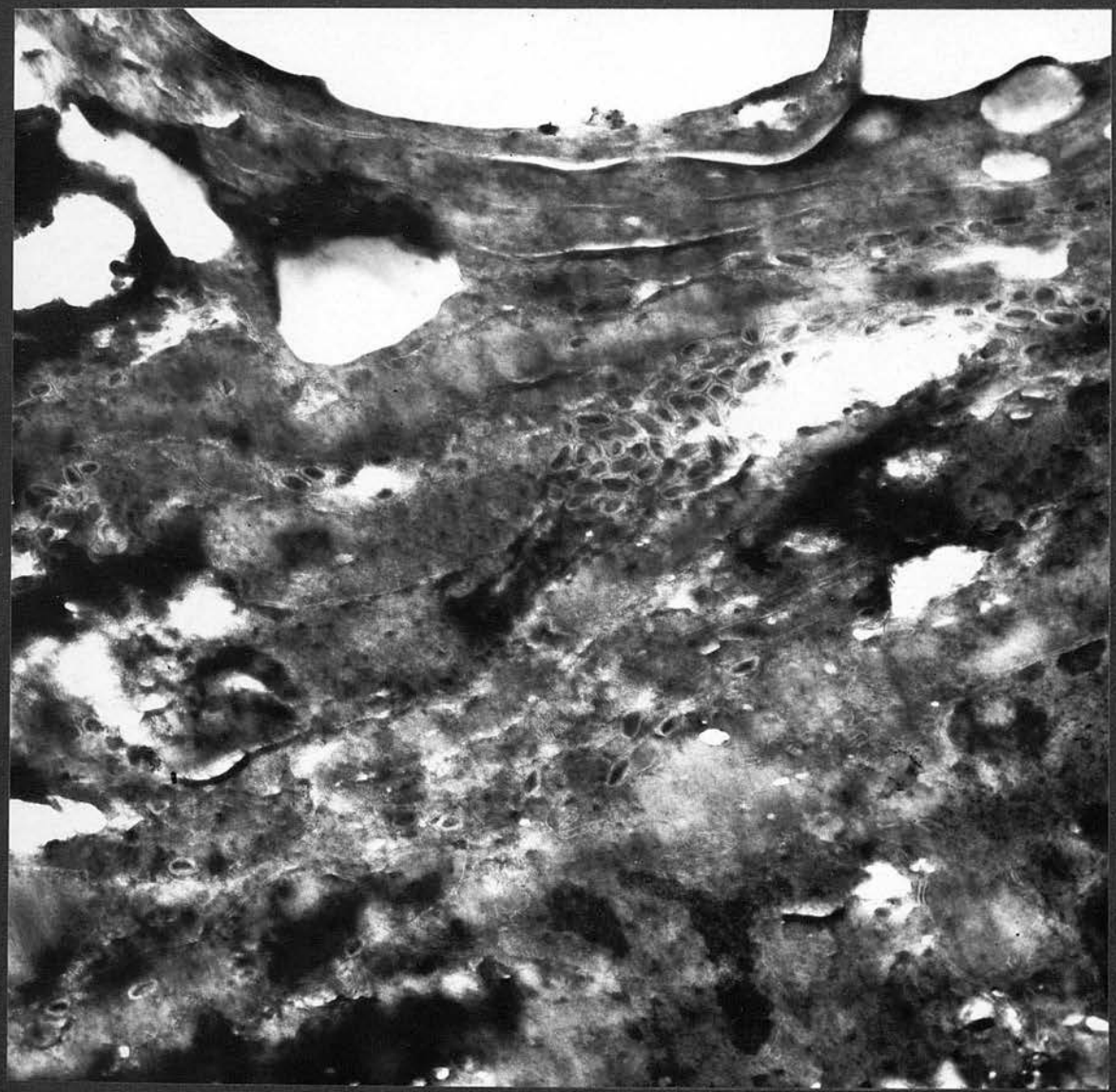


PLATE 56: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. Immature virus particles are only present in the cells of the Stratum granulosum, particularly those cells which are located directly beneath the skin surface. X 10,000

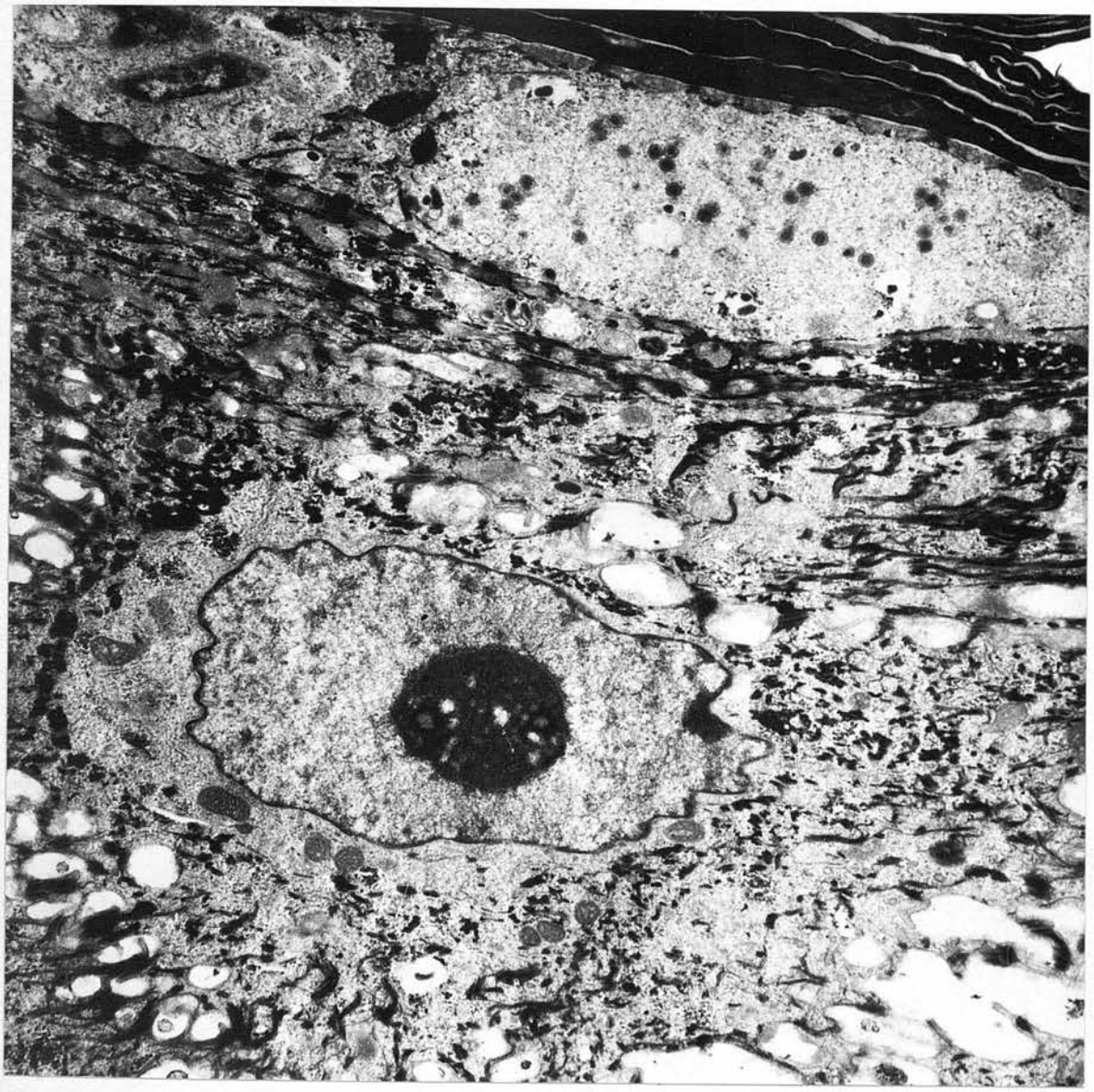


PLATE 57: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. Orf virus particles in different stages of development are present within the same cytoplasm. X 38,000

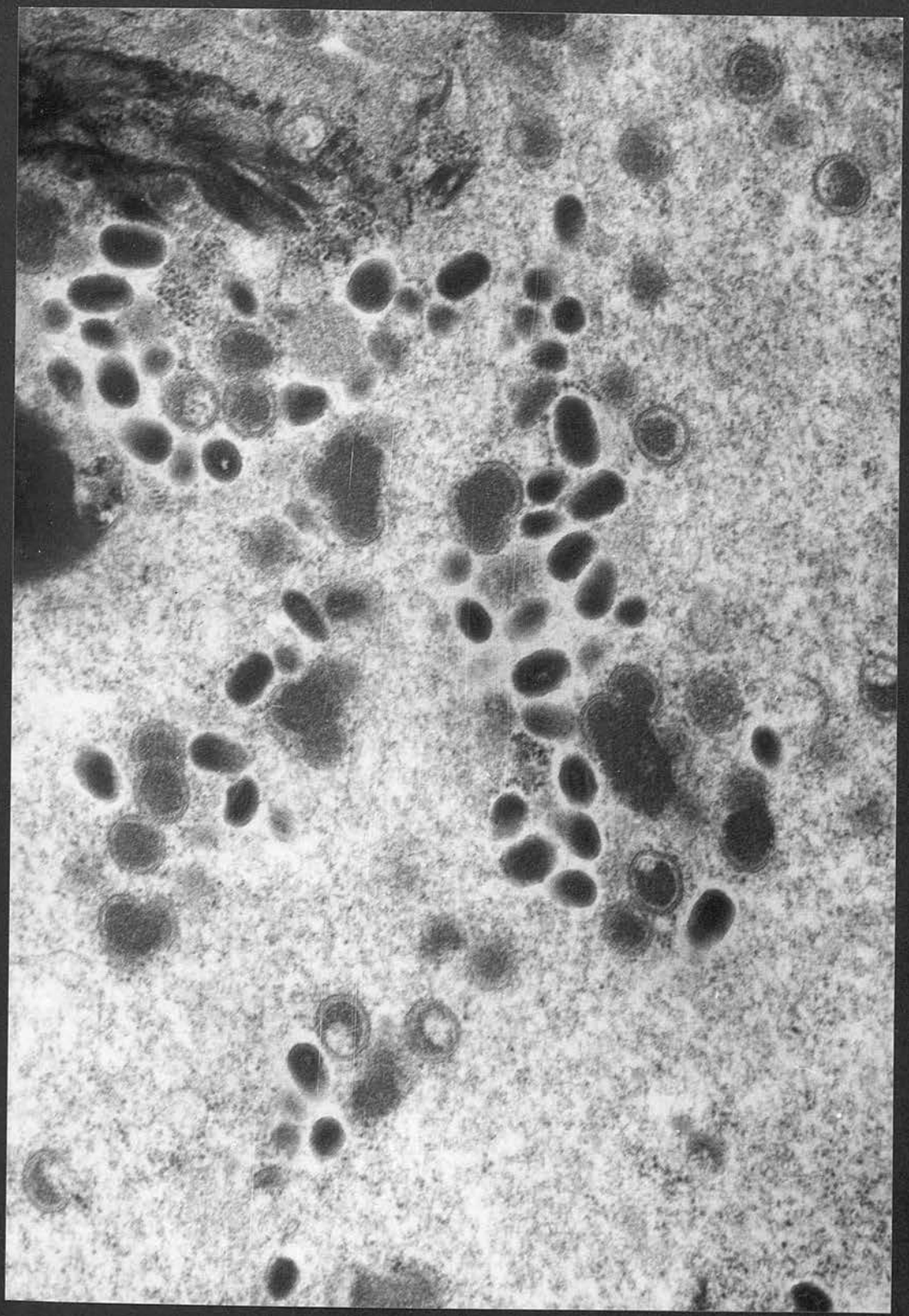
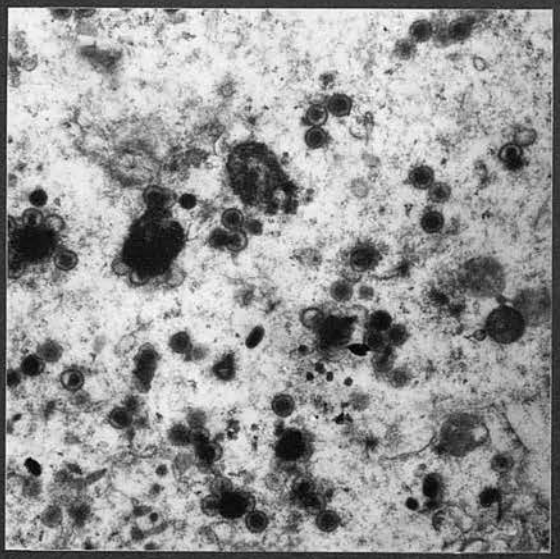


PLATE 58: Electron micrographs of the skin of a previously infected sheep three days after challenge with orf virus.

Upper: Immature virus particles appear in a group surrounding foci of electron-dense viroplasmic materials. Mature virus particles are also present but are few in number. X 10,000

Lower: Immature virus particles are scattered individually in the cytoplasms of infected cells.

X 7,500



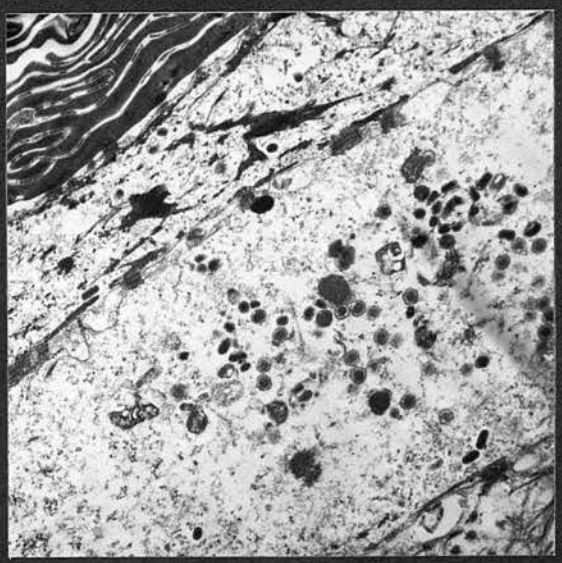
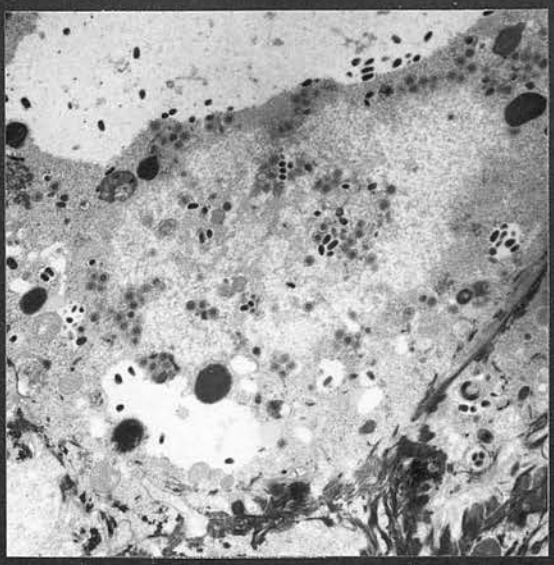


PLATE 59: Electron micrographs of the skin of a previously infected sheep three days after challenge with orf virus.

Upper: A large viroplasmic matrix containing orf virus particles in different stages of maturity is present in the infected cell. X 5,000

Lower: Electron-dense aggregates are diffusely distributed in the cytoplasms of infected cells and they do not contain virus particles. X 5,000



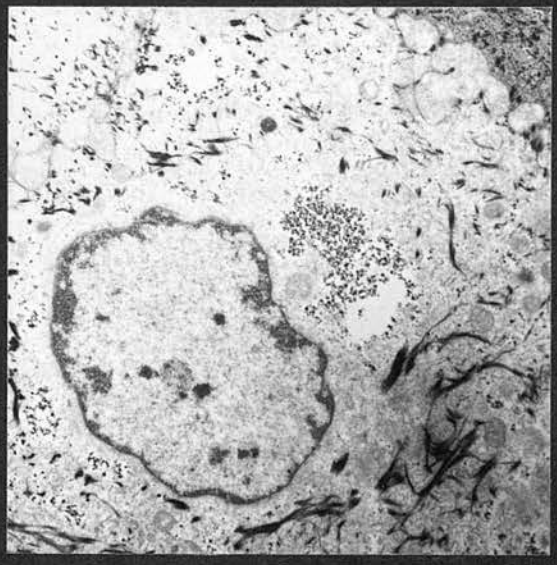


PLATE 60: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. A viroplasmic matrix containing great numbers of "shells" either empty or containing electron-dense granular material are present in the cytoplasms of infected cells. Very few mature virus particles are observed. X 40,000

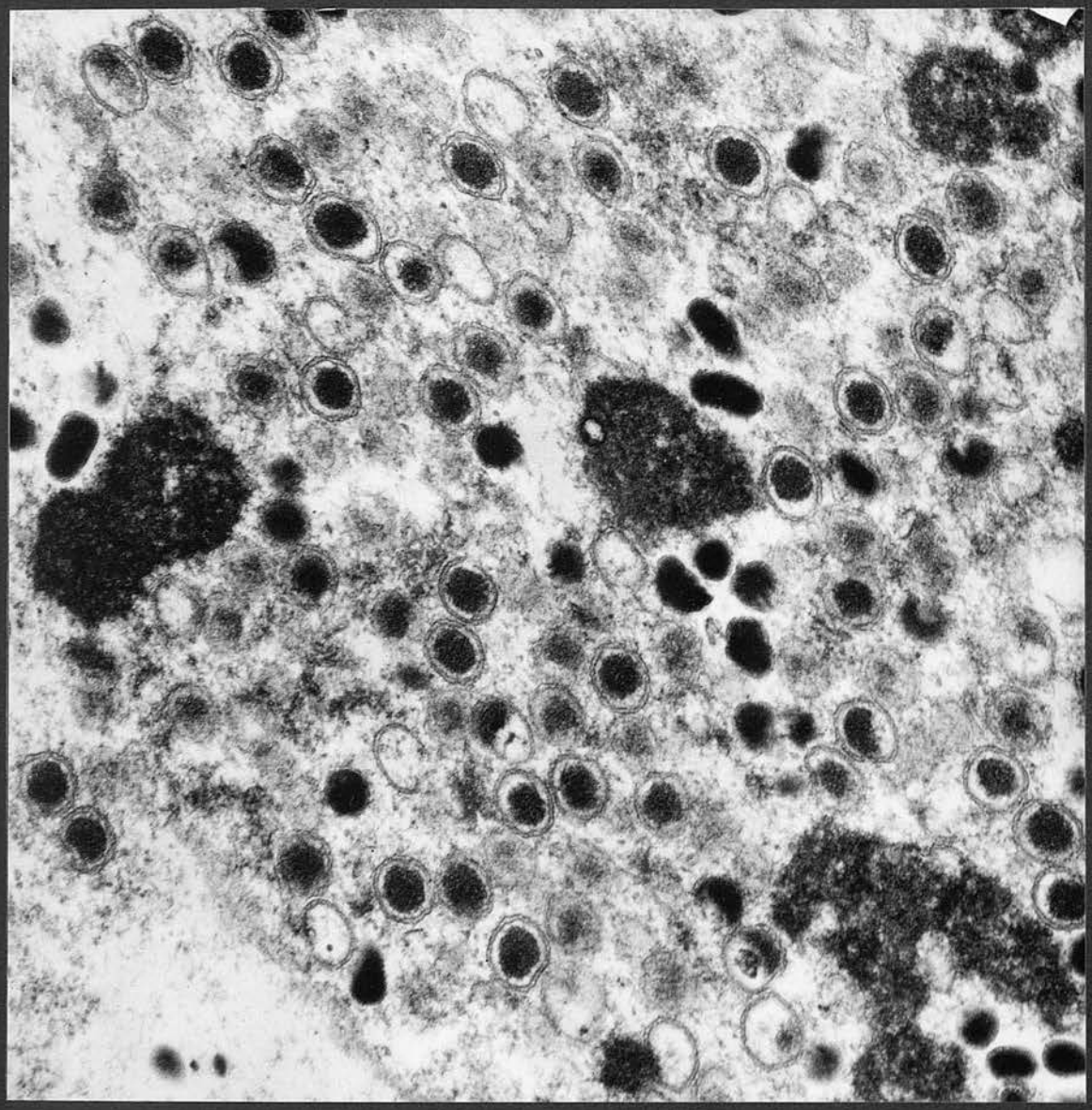


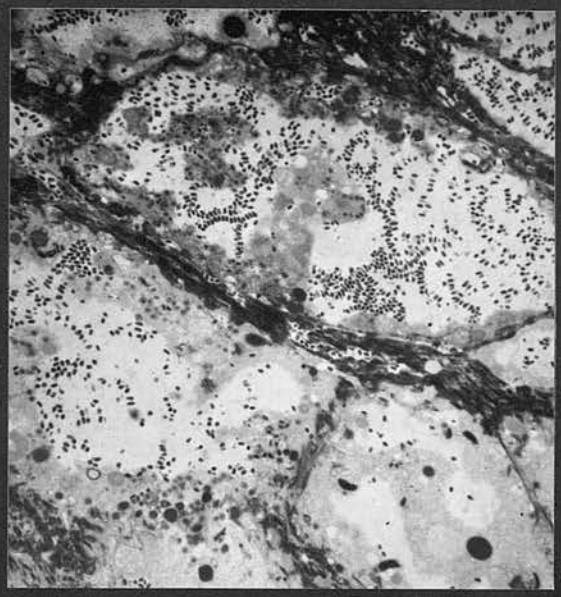
PLATE 61: Electron micrographs of the skin of a previously infected sheep three days after challenge with orf virus. Numerous virus particles are found in most cells of the epidermal layers, particularly those cells of the Stratum granulosum and the cells of the uppermost layers of the Stratum spinosum.

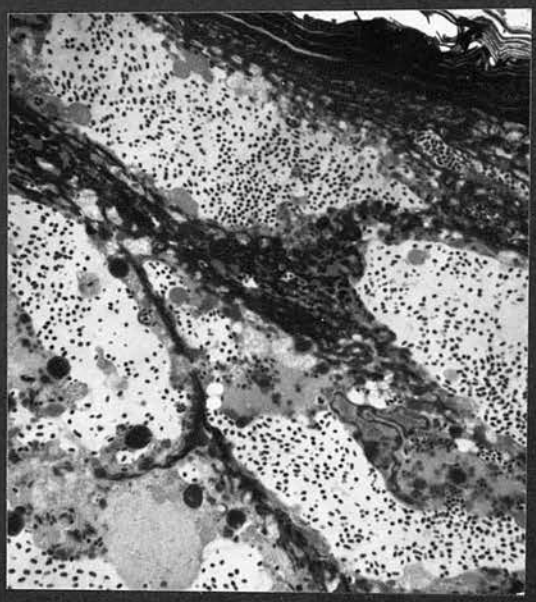
Right x 3,000

Left x 3,000

PLATE 62: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. The cells of the epidermis in cont[act] with the dermis are free of virus activity.

x 6,000





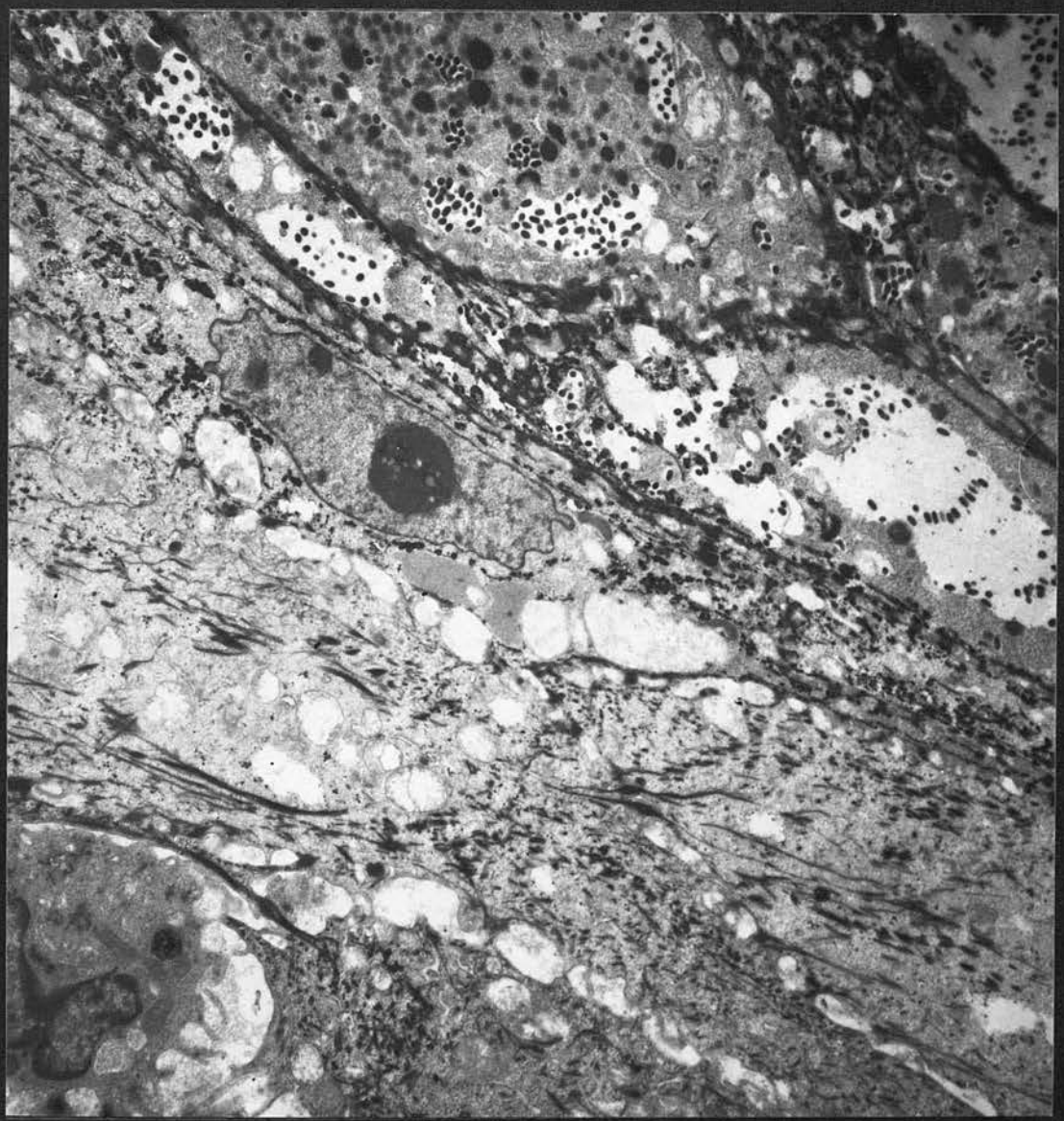


PLATE 64: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. The cytoplasmic constituents of early infected cells are relatively well preserved.

X 10,000

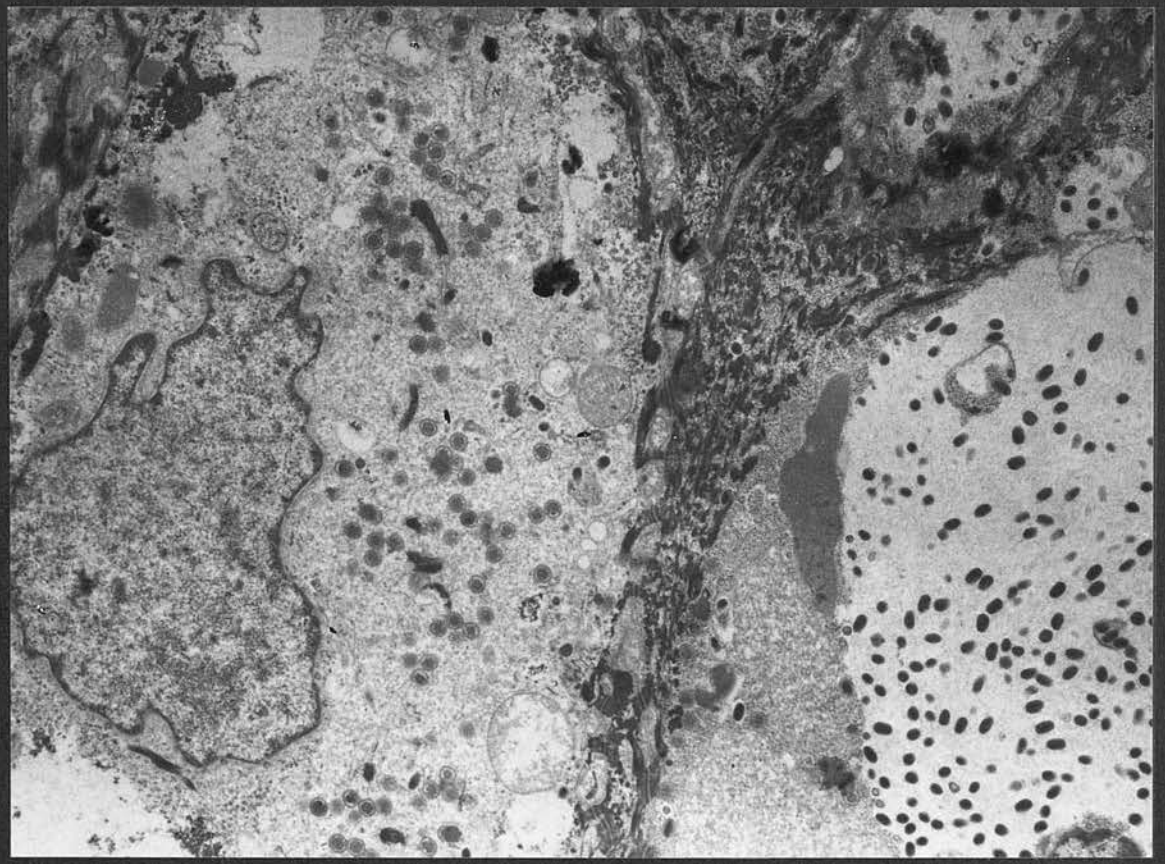


PLATE 65: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. The cells show advanced degeneration and numerous virus particles occur intra- and extra-cellularly. X 10,000

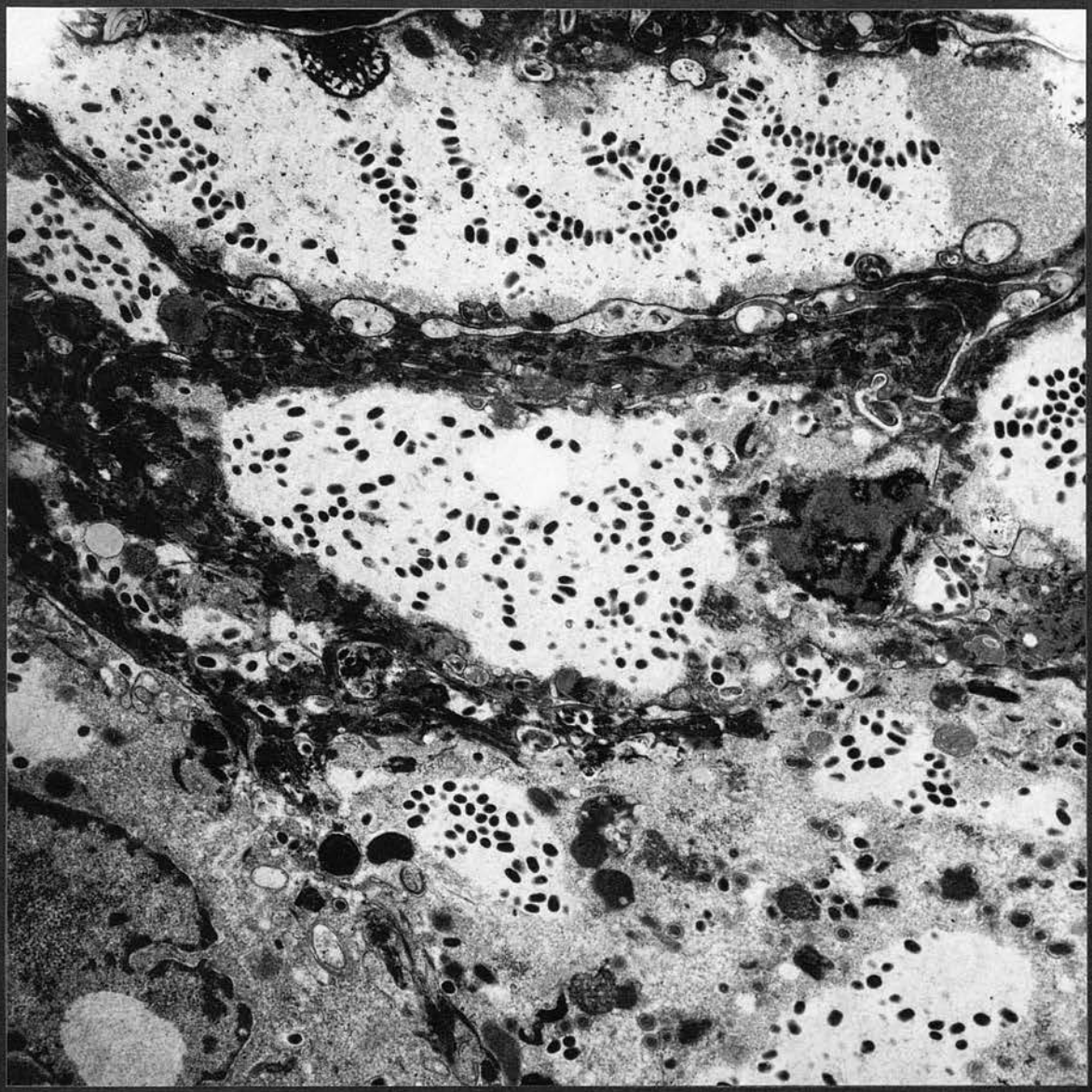


PLATE 66: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. The cytoplasmic constituents of advanced degenerated cells are completely destroyed. The cells only contain virus particles. X 10,000

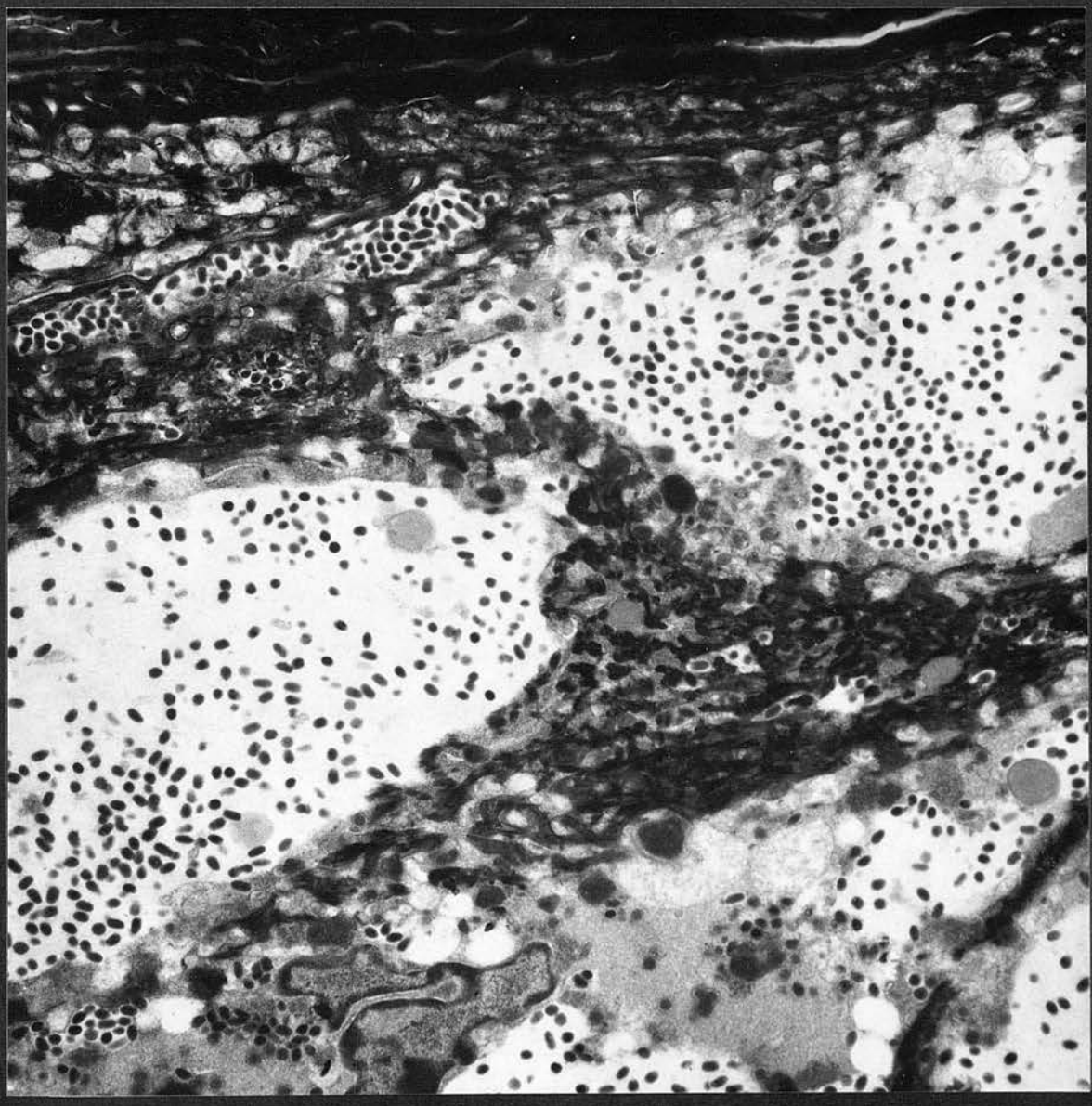


PLATE 67: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. In some epidermal cells, homogeneous material appears in the cytoplasms and virus particles in different stages of development are embedded within this material. X 20,000

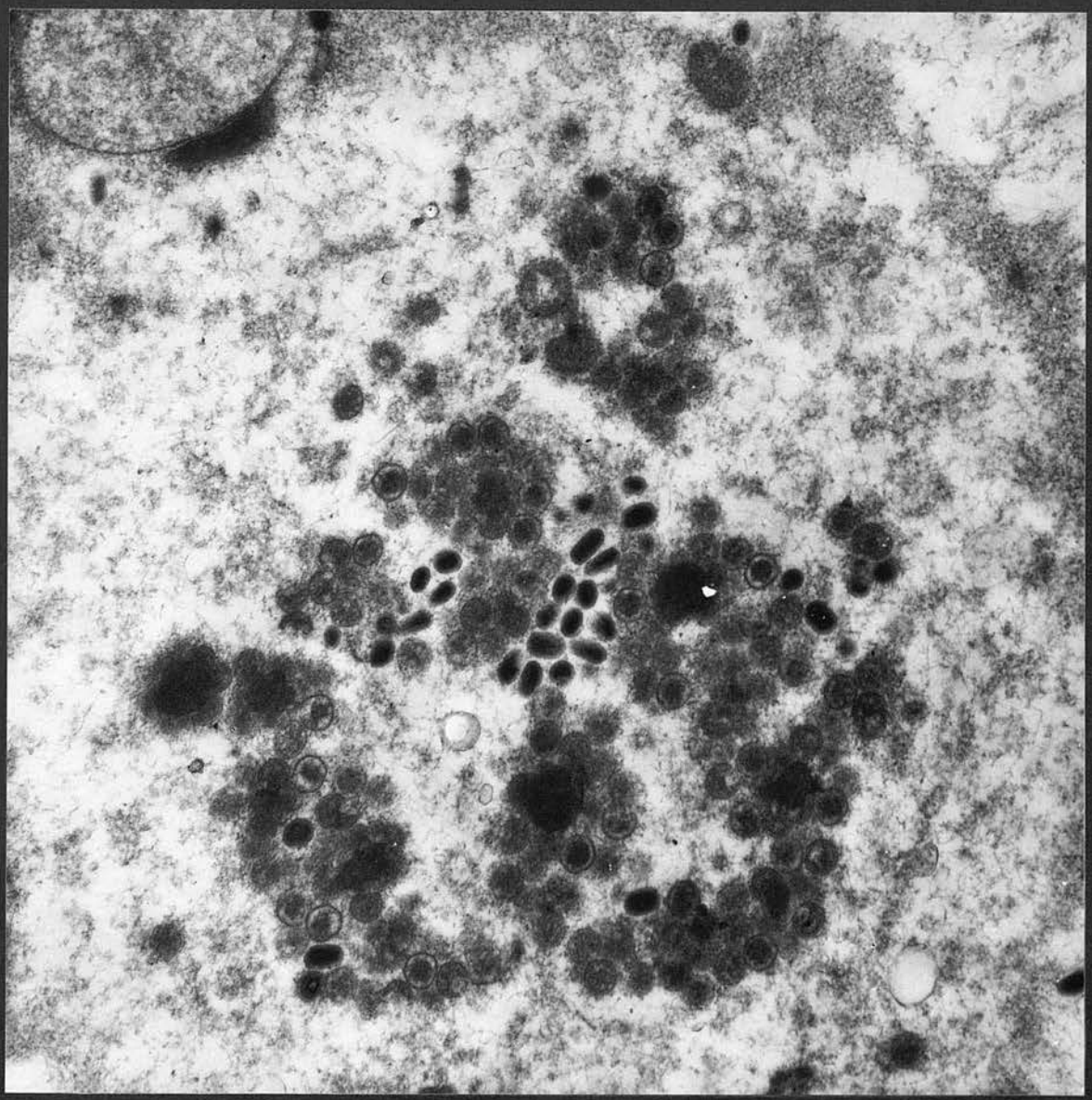


PLATE 68: Electron micrograph of the skin of a previously infected sheep three days after challenge with orf virus. Vesicles differing in size and shape appear in the cytoplasms of infected cells. Each vesicle is bounded with one single membrane. No virus particles were present in the vesicles.

X 10,000

PLATE 69: Electron micrographs of the skin of a previously infected sheep five days after challenge with orf virus.

Upper: Few virus particles occur either in groups or scattered individually in the cytoplasms of infected cells beneath the skin surface. X 3,000

Middle and lower: Other cell layers of the epidermis are well preserved and do not contain virus particles. X 3,000

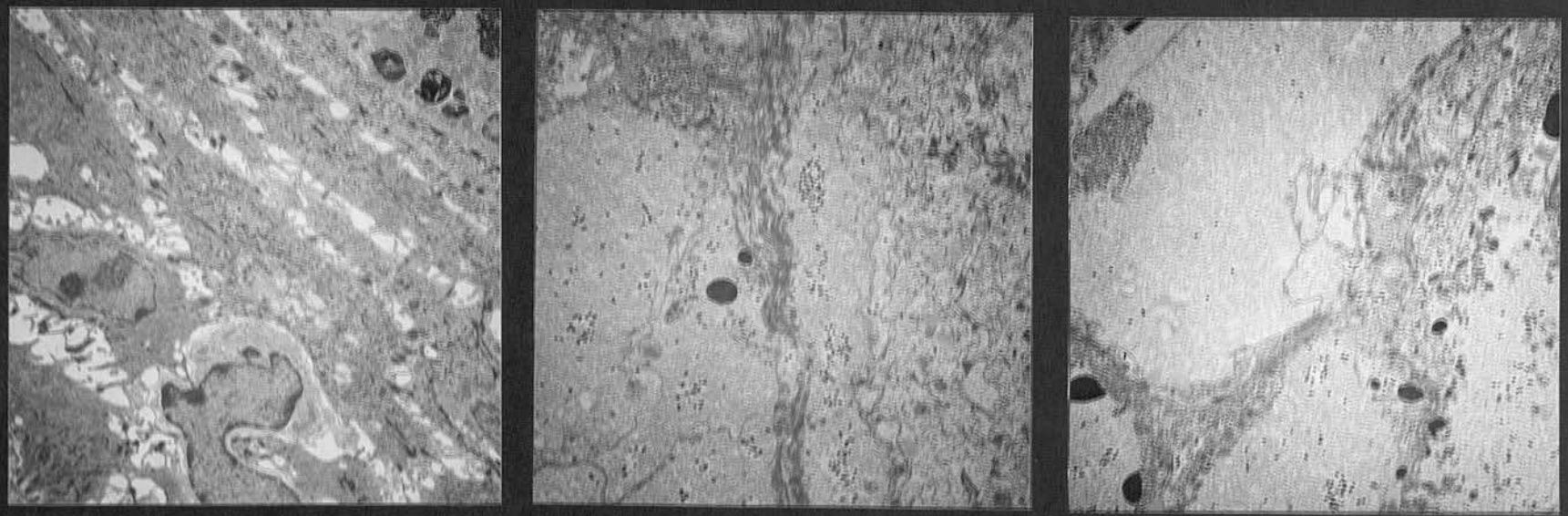


PLATE 70: Electron micrograph of the skin of a previously infected sheep five days after challenge with orf virus. Immature virions are still evident in the cytoplasms of infected cells. X 10,000

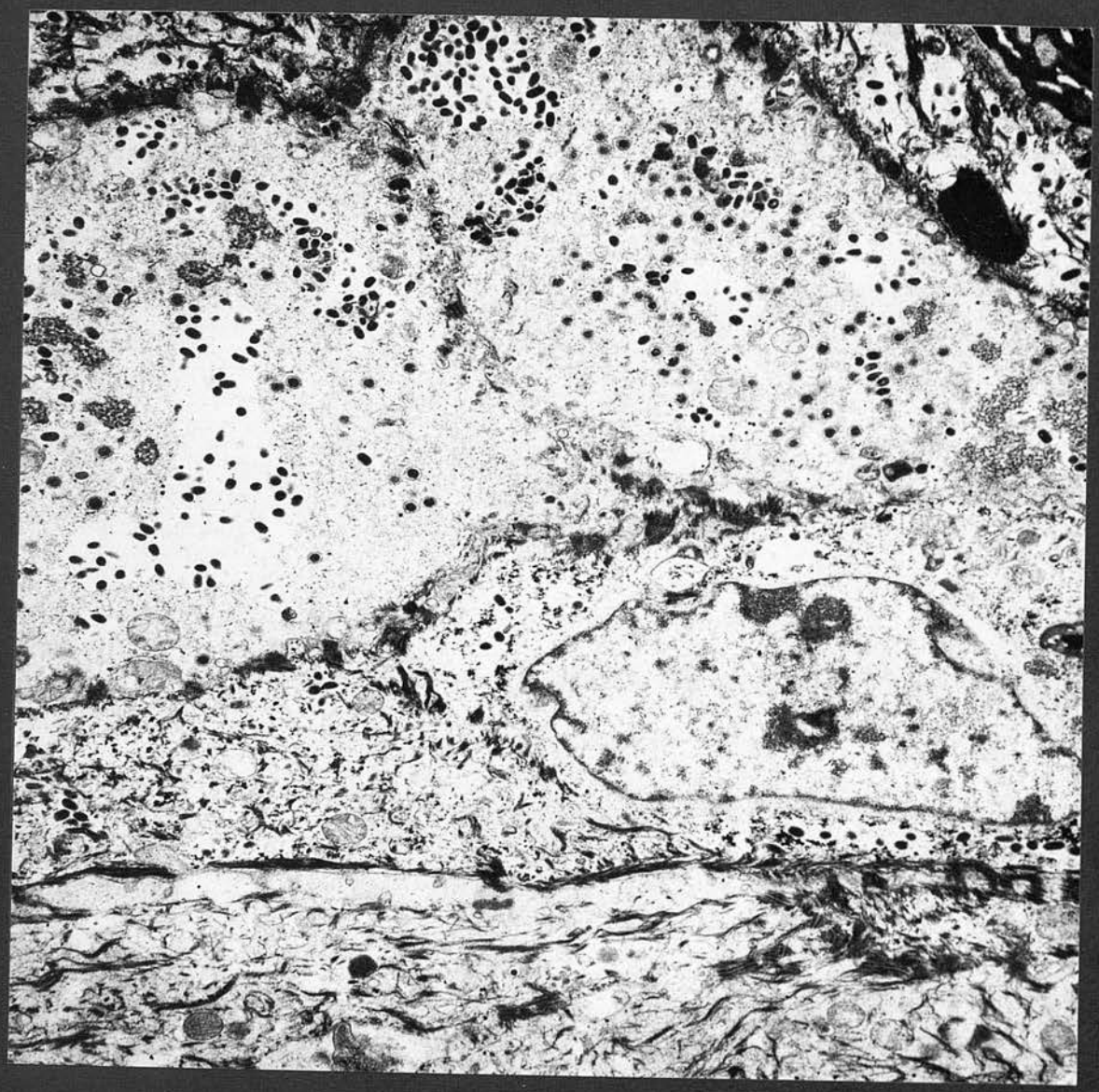


PLATE 71: Electron micrograph of the skin of a previously infected sheep five days after challenge with orf virus. Large numbers of complete virus particles appear in ruptured vesicles in the infected cells. Two virus particles are bounded by a membrane. A few virus particles are scattered individually. X 40,000

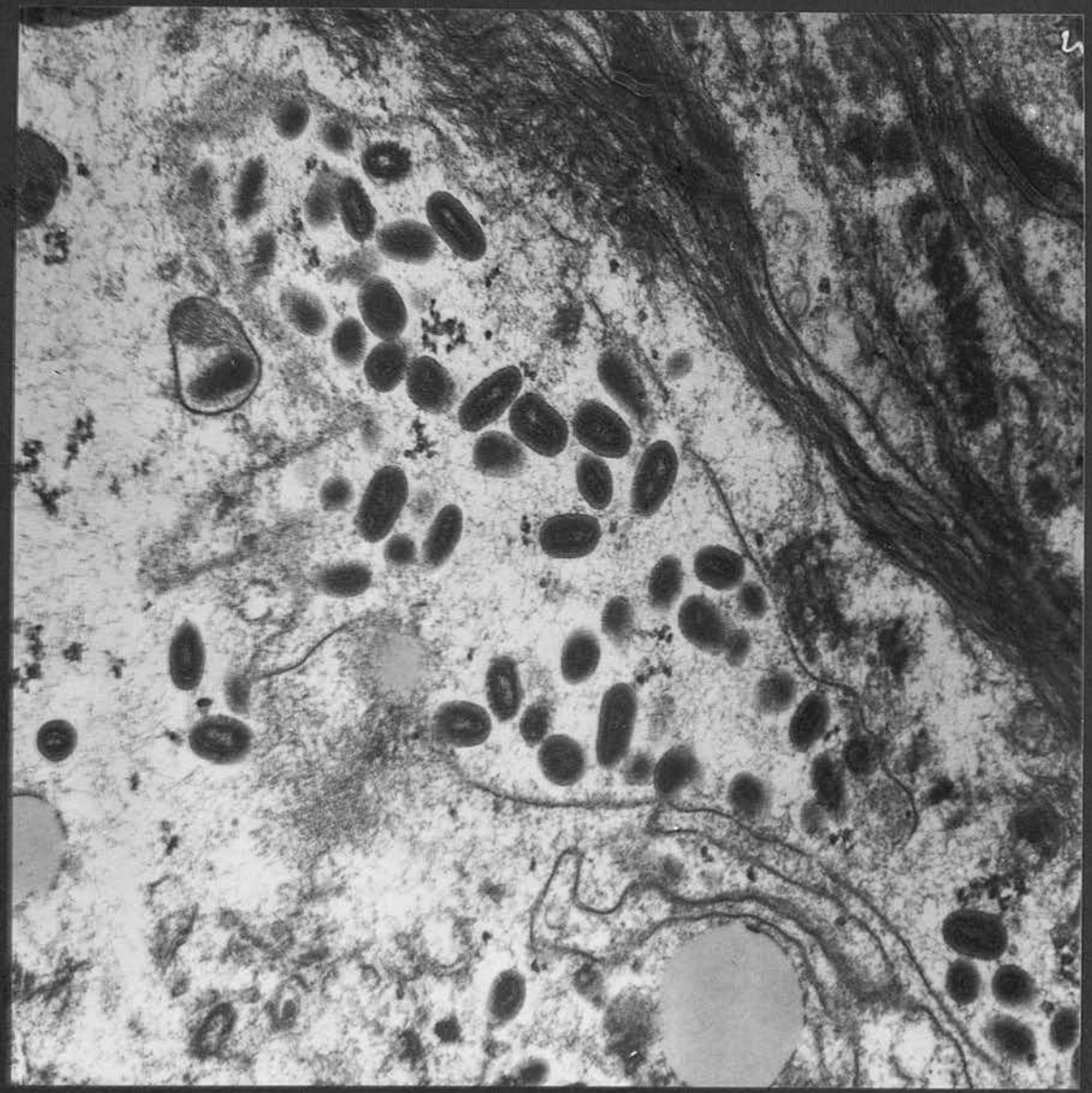


PLATE 72: Electron micrograph of the skin of a previously infected sheep five days after challenge with orf virus. Virus particles in different stages of maturity occur in the cytoplasms of epidermal cells. Mature virus particles are present extracellularly. X 10,000

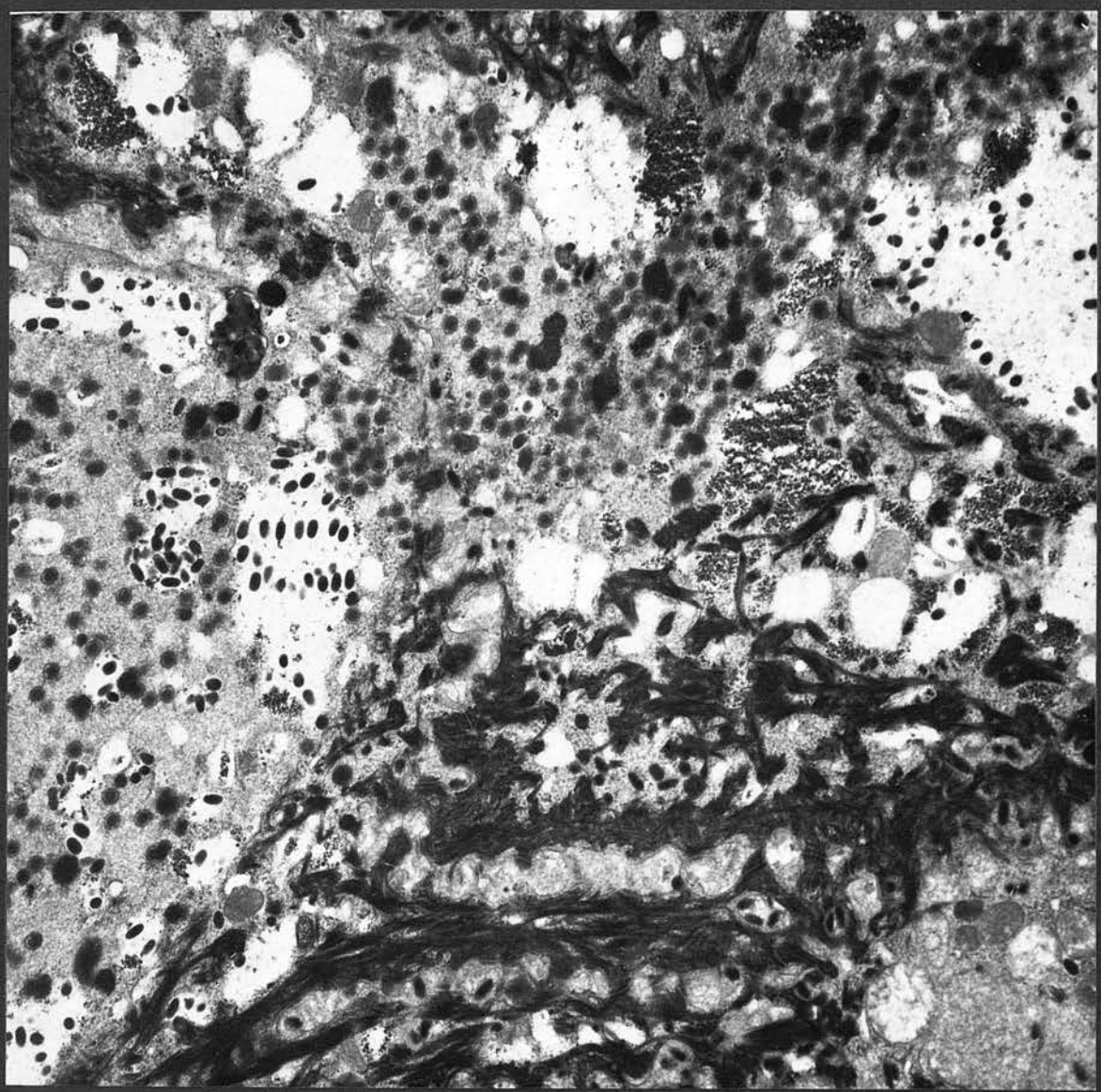


PLATE 73: Electron micrographs of the skin of a previously infected sheep five days after challenge with orf virus. The dermis shows cellular infiltration consisting mainly of polymorphs, lymphocytes and macrophages and none of these cells contain orf virus particles.

Upper	X 3,000
Middle	X 3,000
Lower	X 3,000

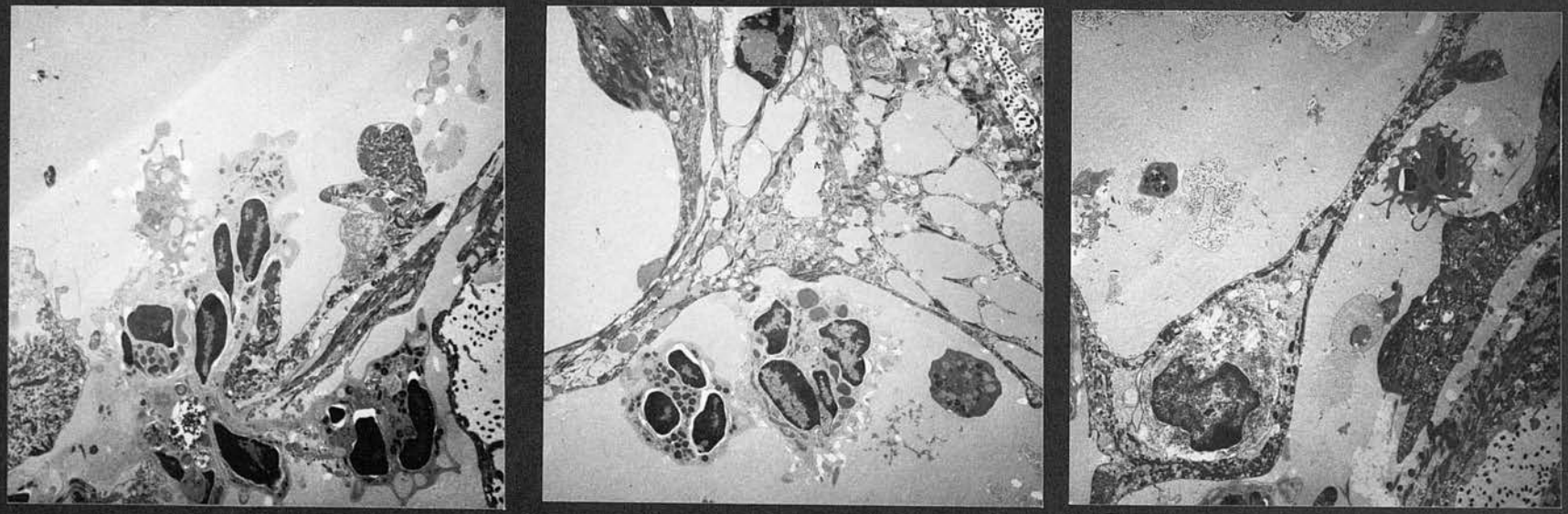


PLATE 74: Electron micrograph of the skin of a previously infected sheep five days after challenge with orf virus. A small blood vessel in the dermis is engorged with red blood corpuscles and one lymphocyte. No virus particles are present in the dermis.

X 6,000

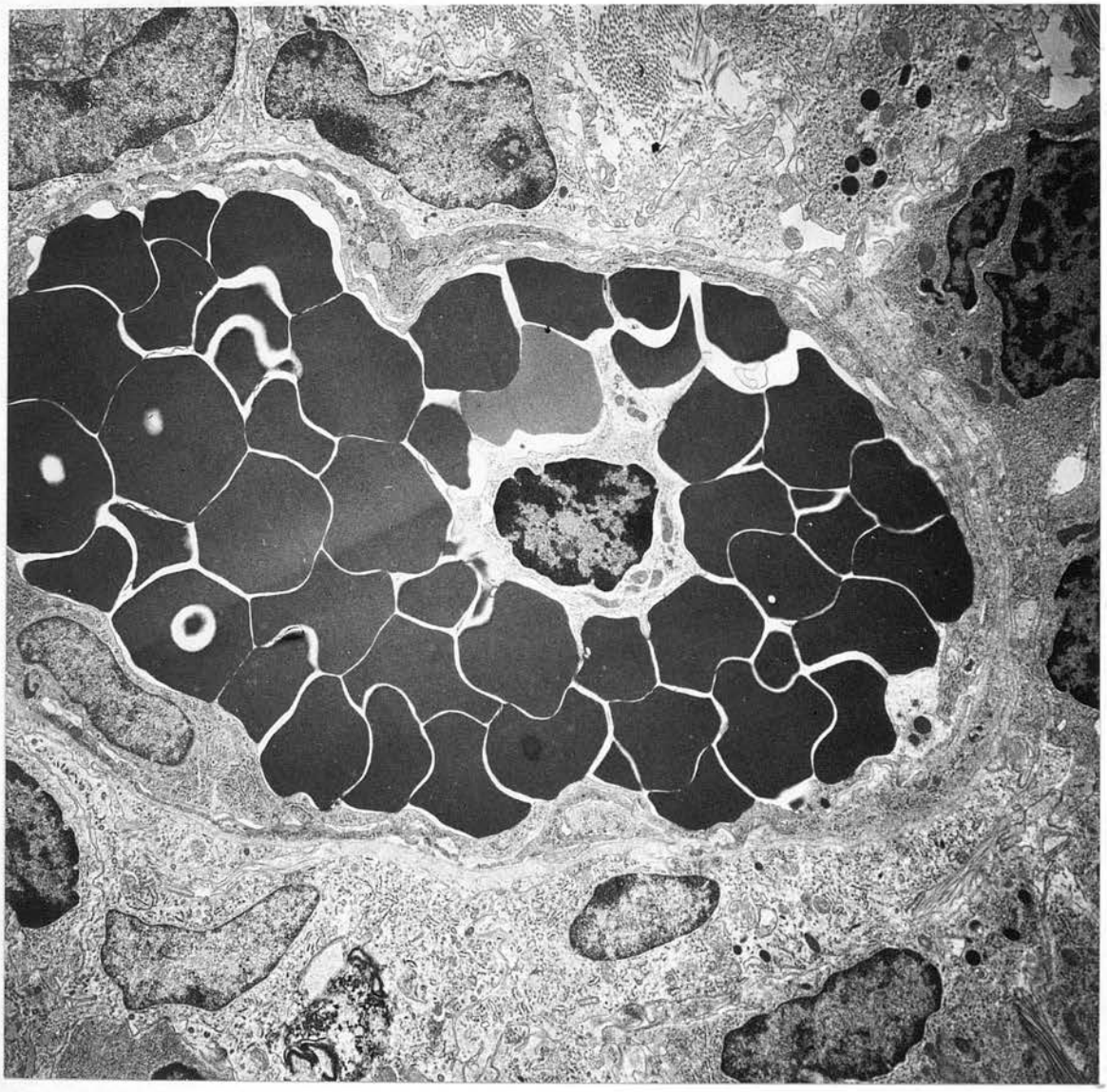


PLATE 75: Electron micrograph of the skin of a previously infected sheep six days after challenge with orf virus. Numerous virus particles are present in all epidermal layers intracellularly and extracellularly. The cytoplasmic organelles are completely destroyed. X 6,000

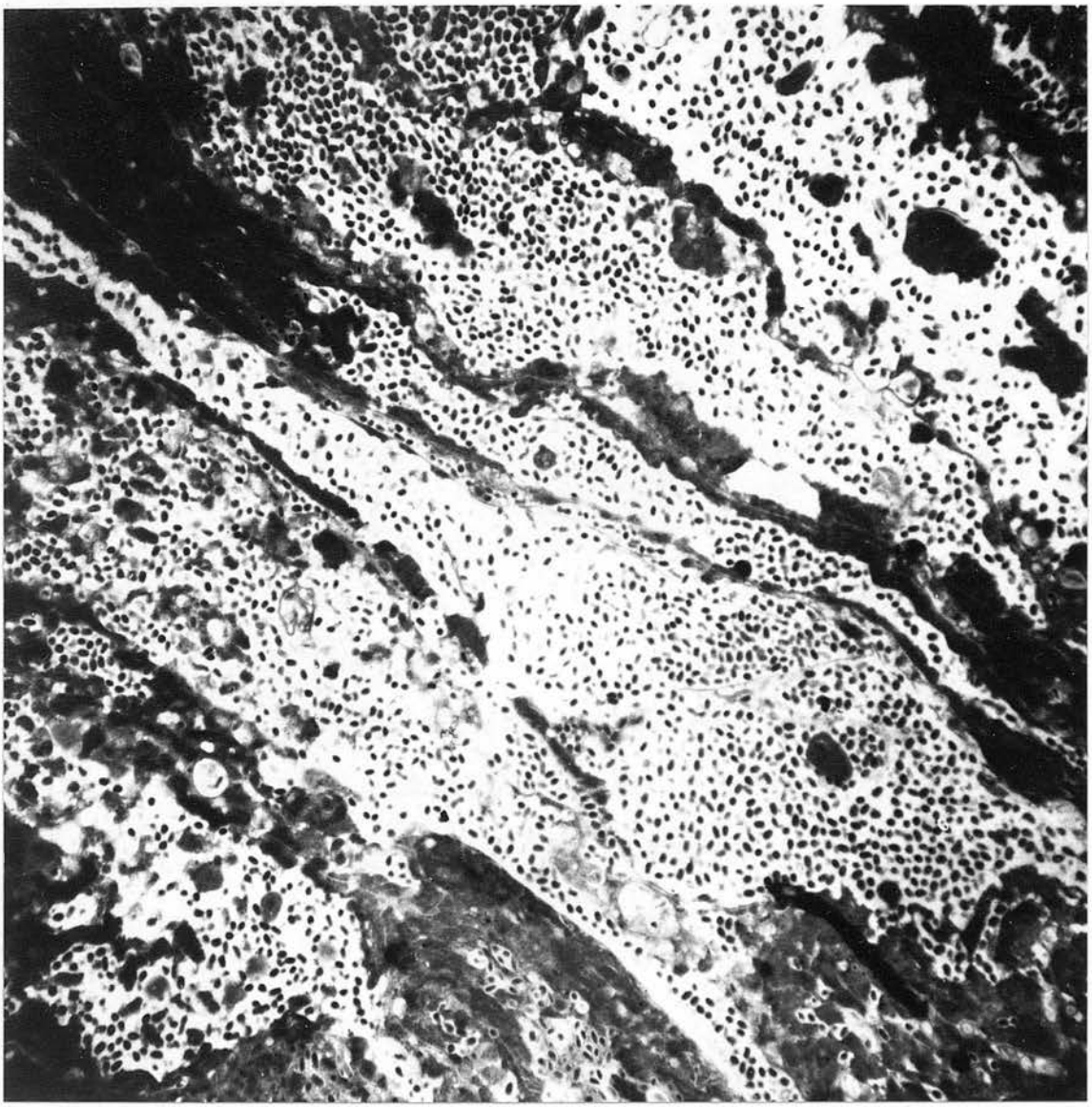


PLATE 76: Electron micrograph of the skin of a previously infected sheep six days after challenge with orf virus. Vacuoles containing orf virus particles appear in the cytoplasms of infected cells. X 10,000

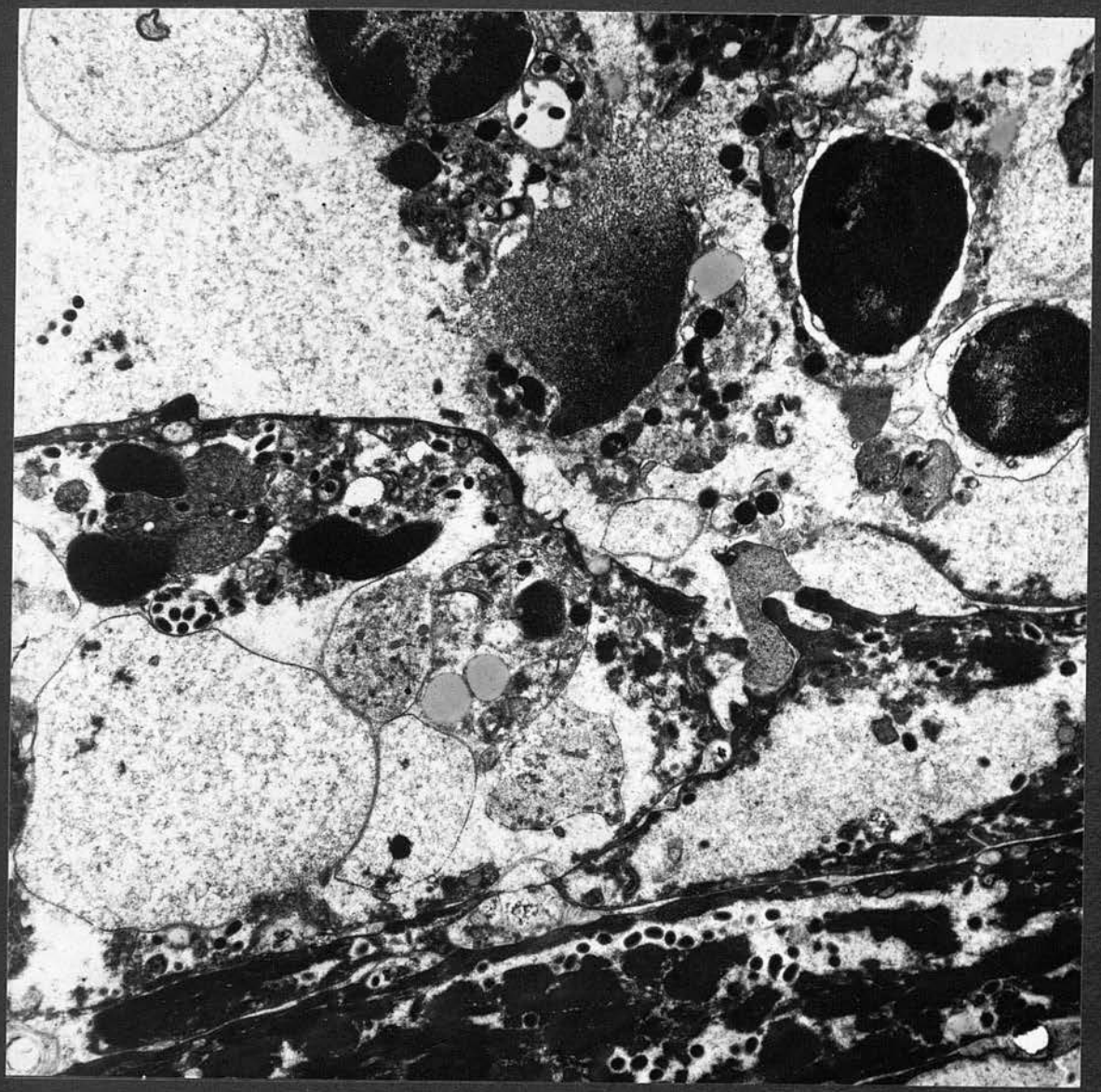


PLATE 77: Electron micrograph of the skin of a previously infected sheep seven days after challenge with orf virus. Mature virus particles are seen in the cytoplasms of infected cells. Homogeneous material surrounded by numerous complete virus particles occurs in these cells. X 20,000

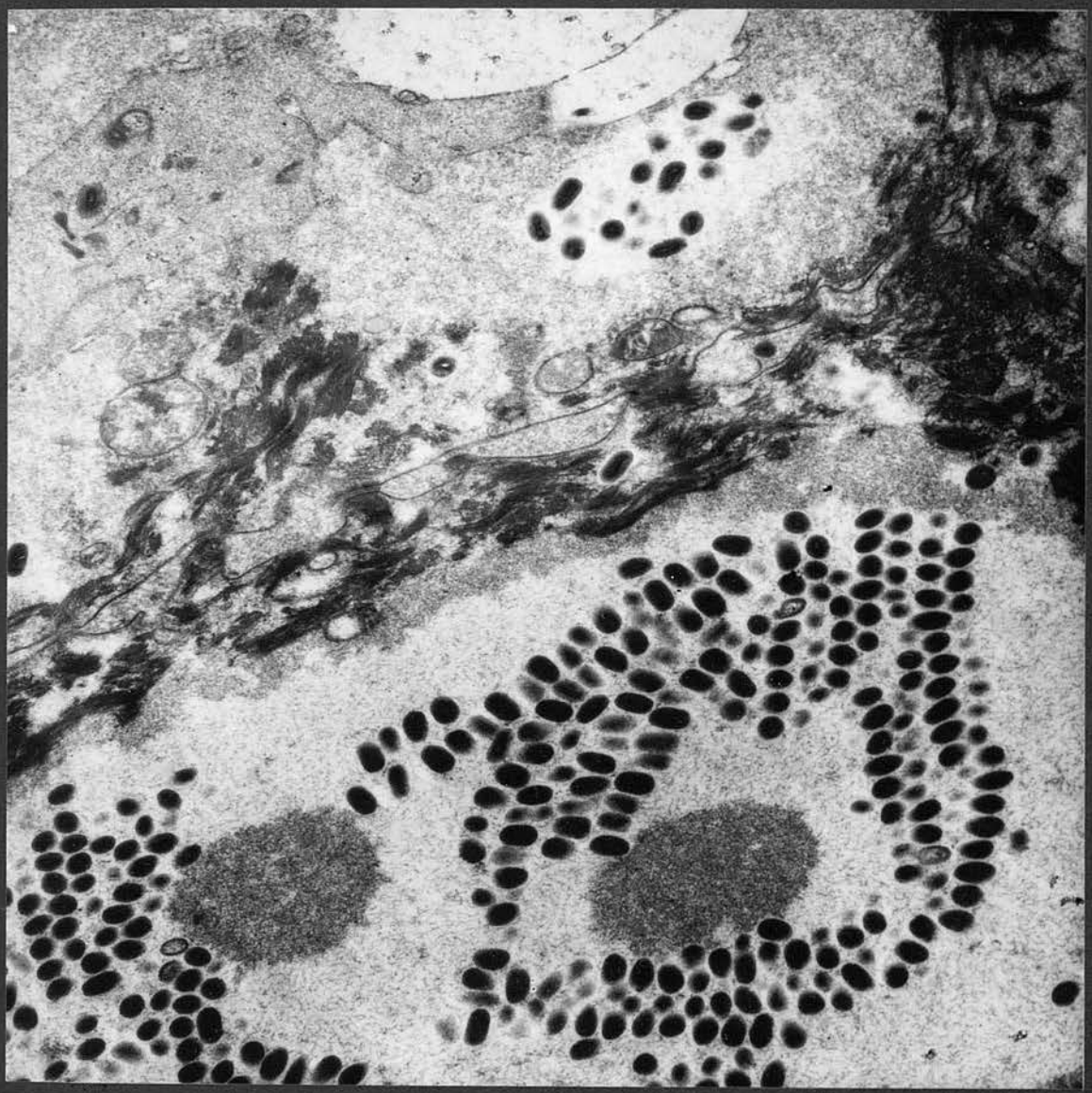


PLATE 78: Electron micrograph of the skin of a previously infected sheep seven days after challenge with orf virus. The number of virus particles are fewer than in the preceding period of infection.

x 6,000

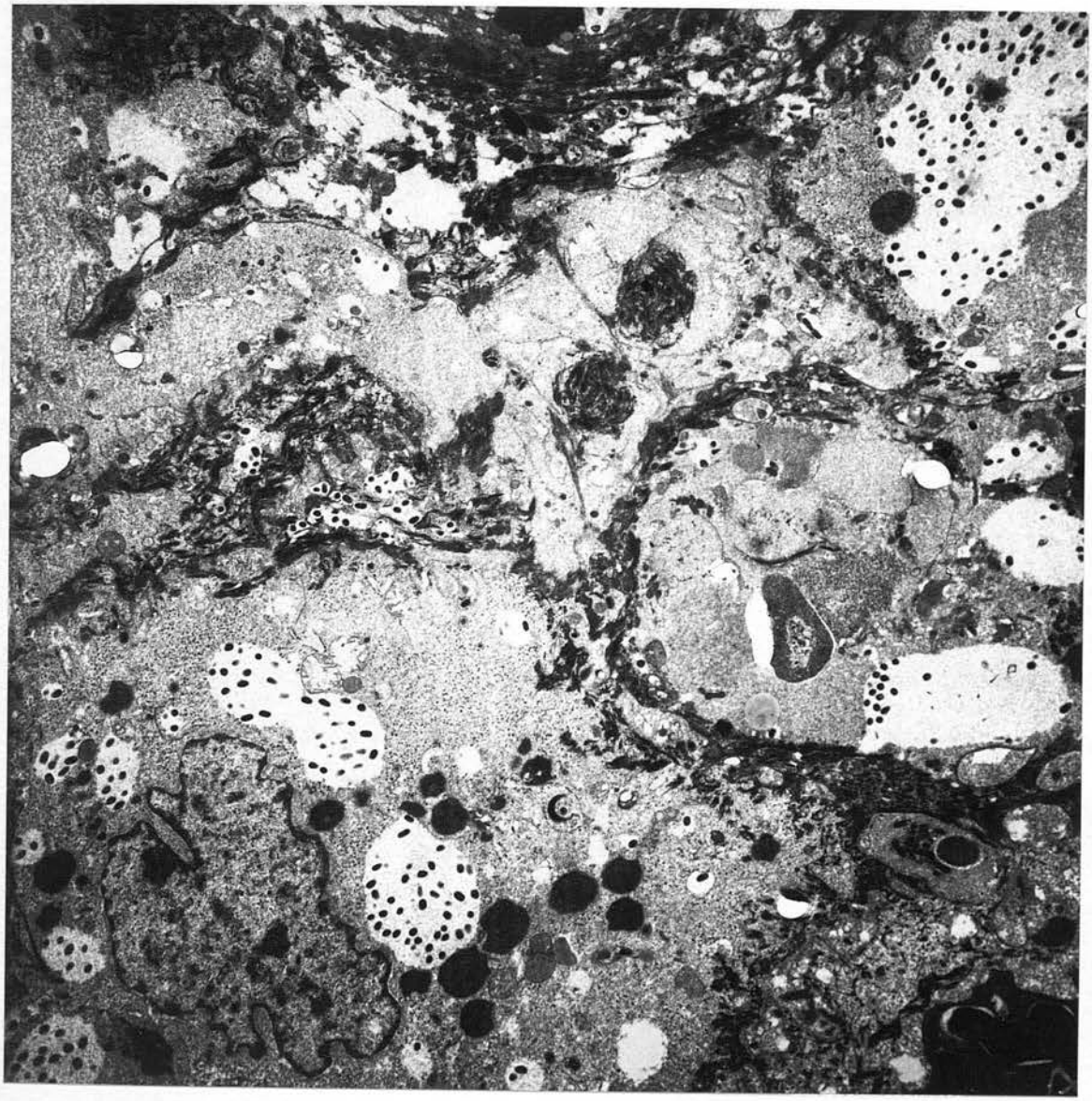


PLATE 79: Electron micrograph of the skin of a previously infected sheep seven days after challenge with orf virus. Virus particles are present extracellularly as well as intracellularly. The nuclei of infected cells are small in size and in a highly degenerated state. X 6,000

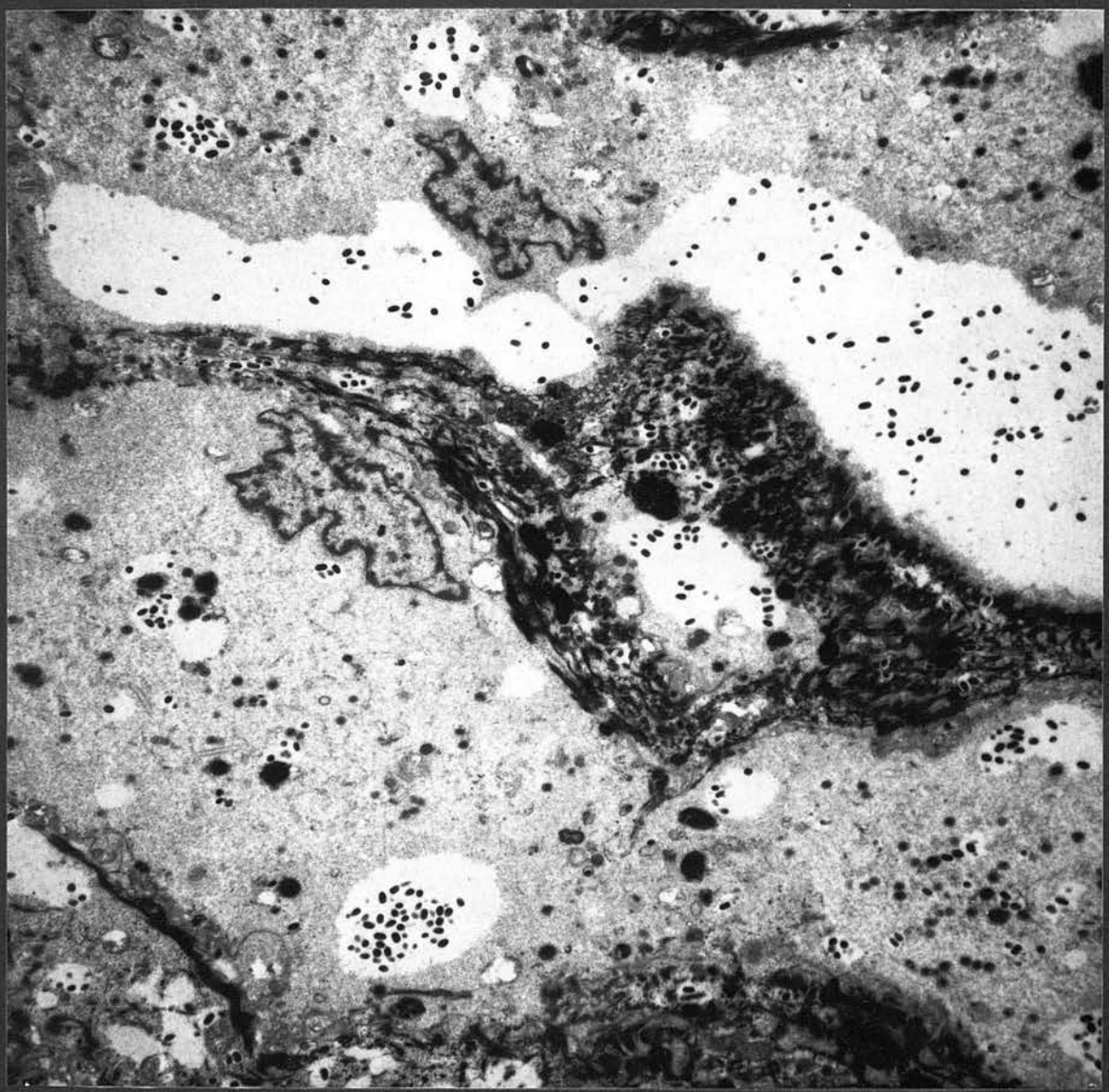


PLATE 80: Electron micrograph of the skin of a previously infected sheep seven days after challenge with orf virus. Vacuoles containing a variable number of virus particles appear in the extracellular spaces. X 10,000

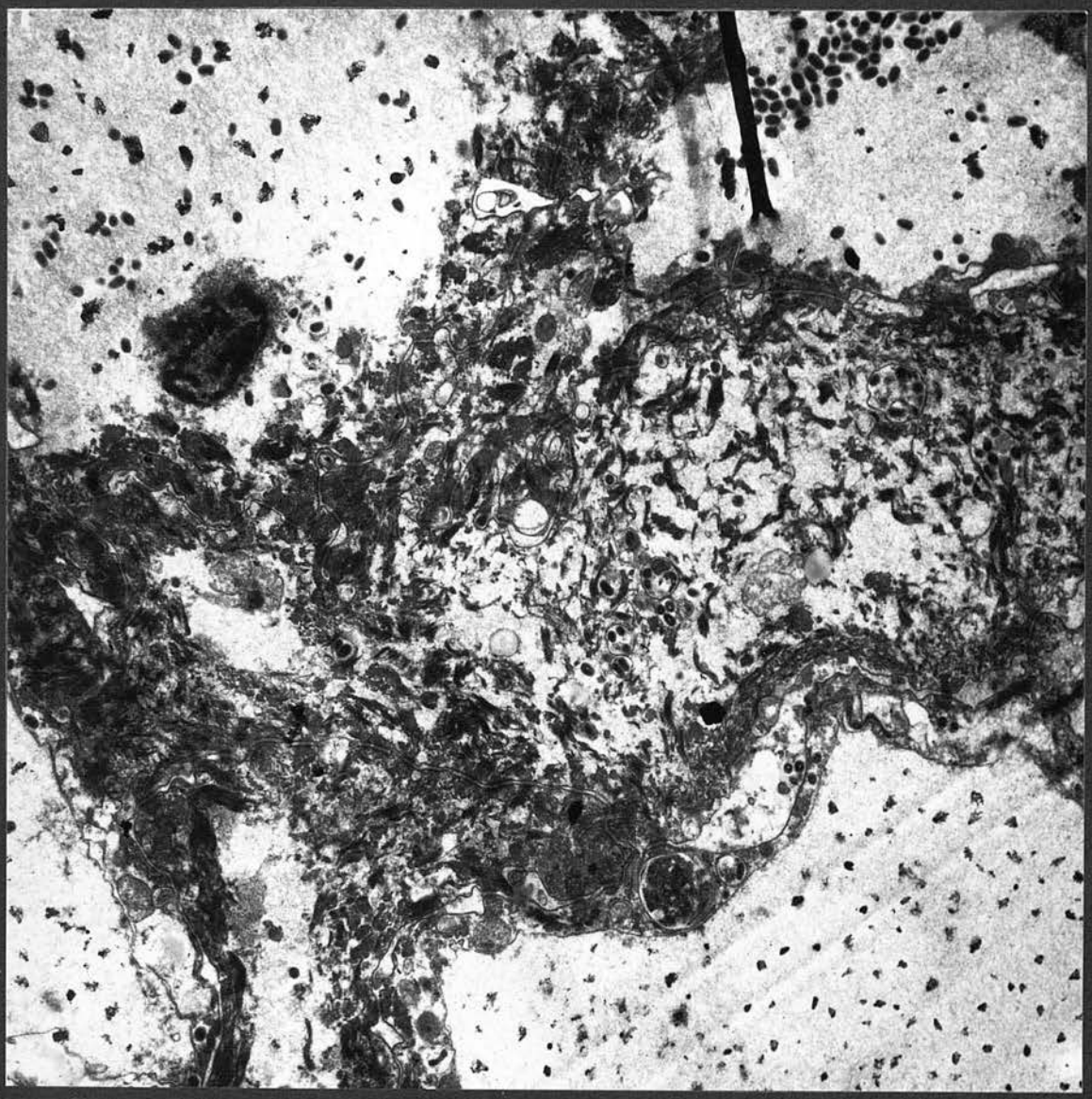
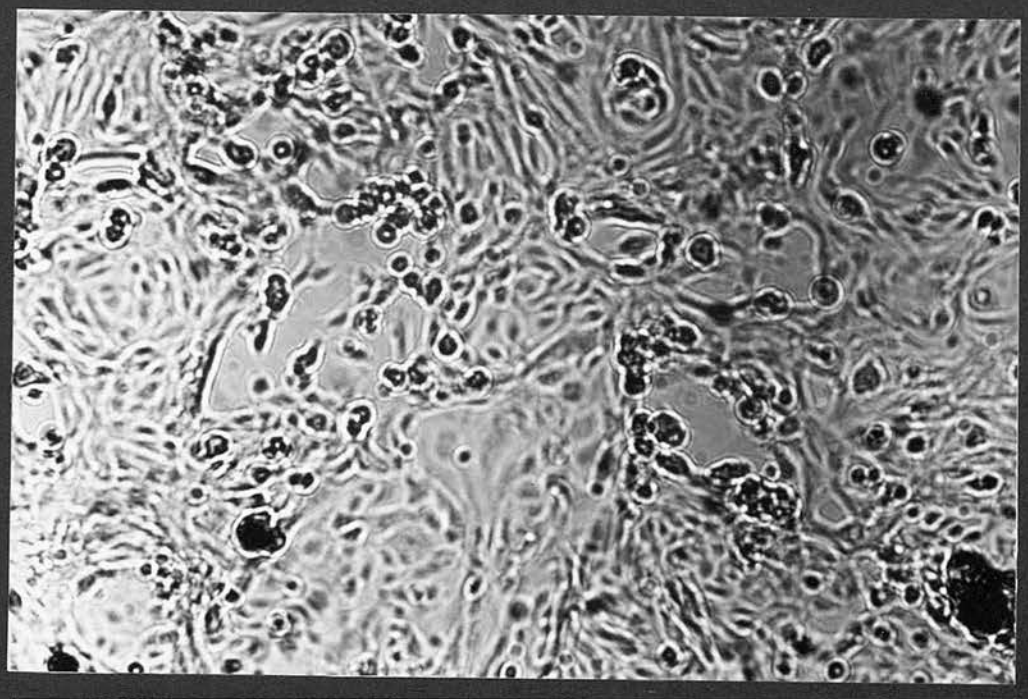


PLATE 81: Primary monolayer of LK cells three days after inoculation with the third passage of orf virus. Early cytopathic effects include discrete refractile cells. x 75

PLATE 82: Primary monolayer of LK cells five days after inoculation with the third passage of orf virus. Showing advanced cytopathic effects. x 75

PLATE 83: Primary monolayer of LK cells seven days after inoculation with the third passage of orf virus. The whole monolayer is affected. x 75



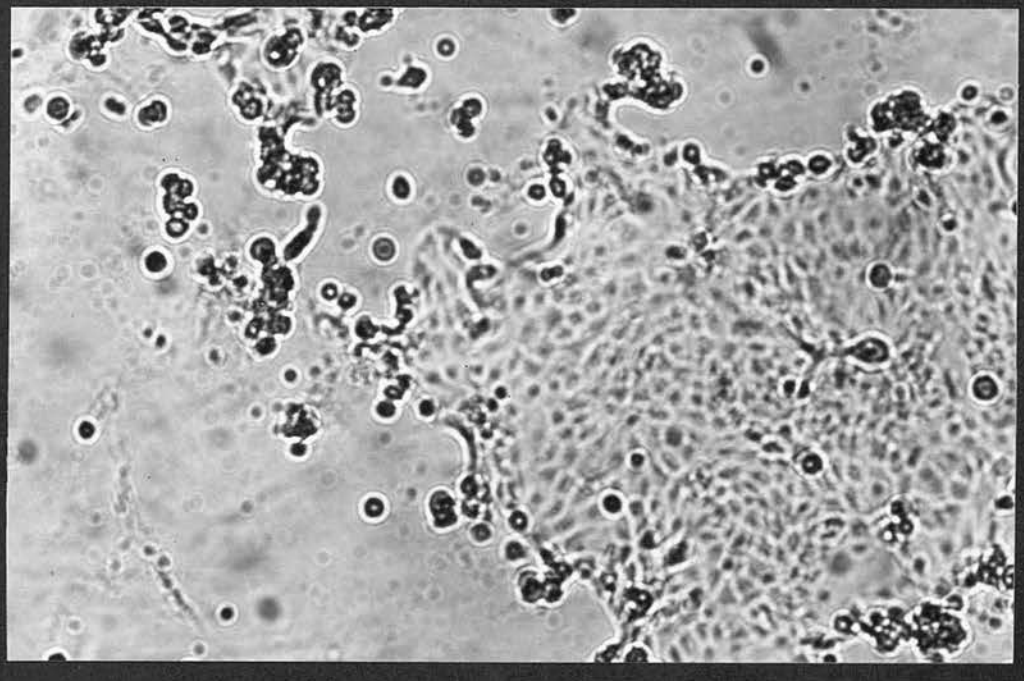


PLATE 84: Viability of culture-adapted orf virus in the scarified skin of a susceptible lamb.

PLATE 85: Orf virus particles in infected fluid from FLK cell cultures stained with PTA. x 60,000


27.11.73

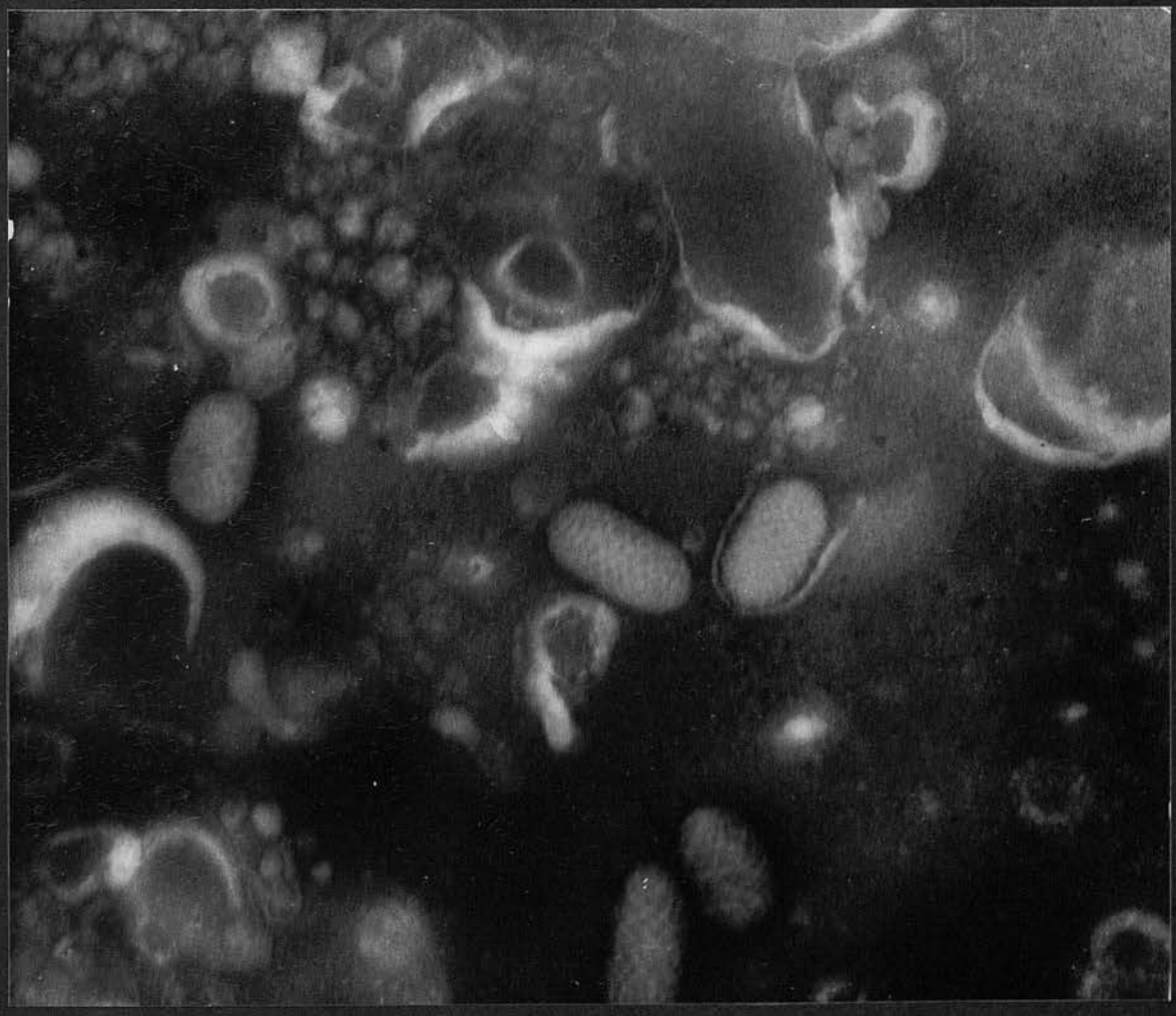
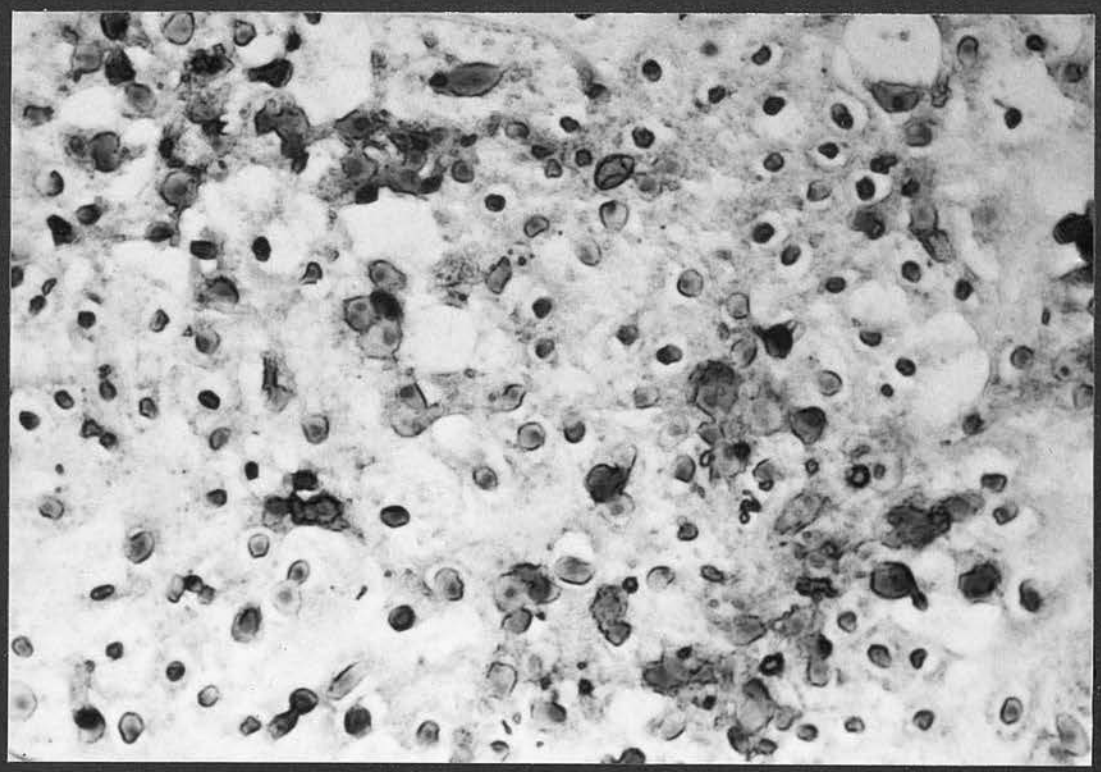


PLATE 86: Primary monolayer of LK cells 24 hours after inoculation with culture-adapted orf virus. A few ill-defined granular matrices appear in the cytoplasms of a few infected cells. Stained with Giemsa. X 140

PLATE 87: Primary monolayer of LK cells 72 hours after inoculation with culture-adapted orf virus. Granular matrices appear in the cytoplasms of many infected cells. Stained with Giemsa. X 350



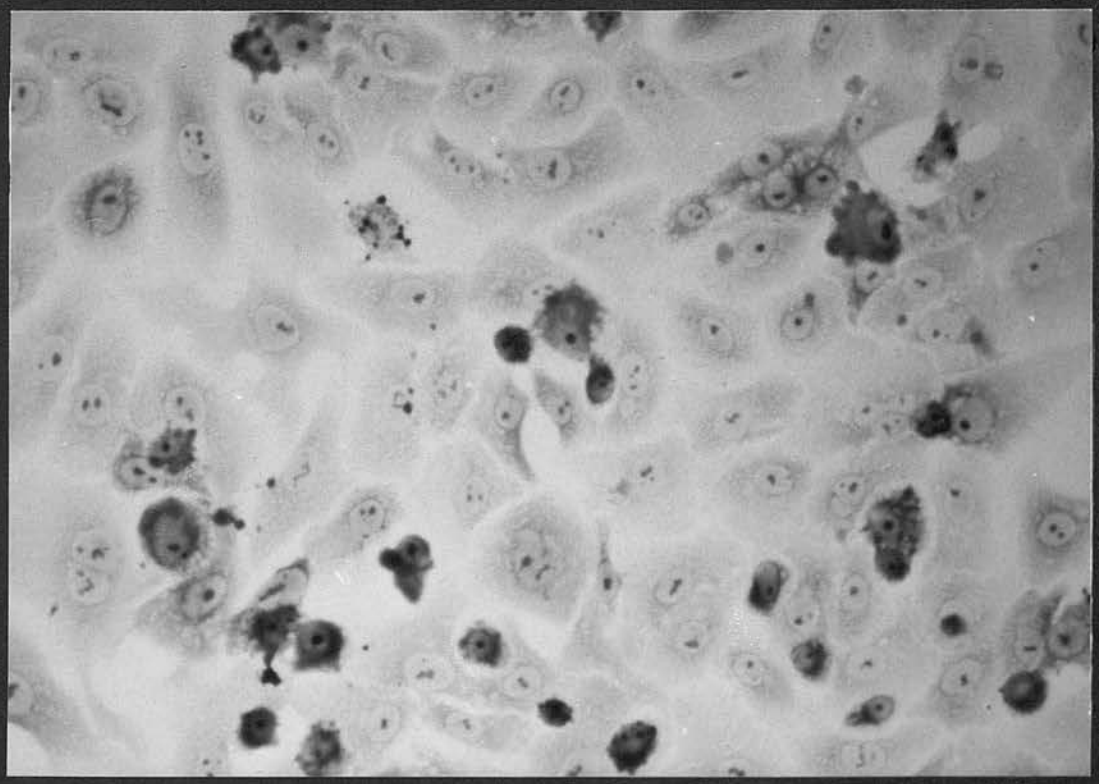


PLATE 88: Electron micrograph of FLK cell cultures immediately after inoculation with culture-adapted orf virus. The cells appear normal. No virus particles are seen.

X 15,000

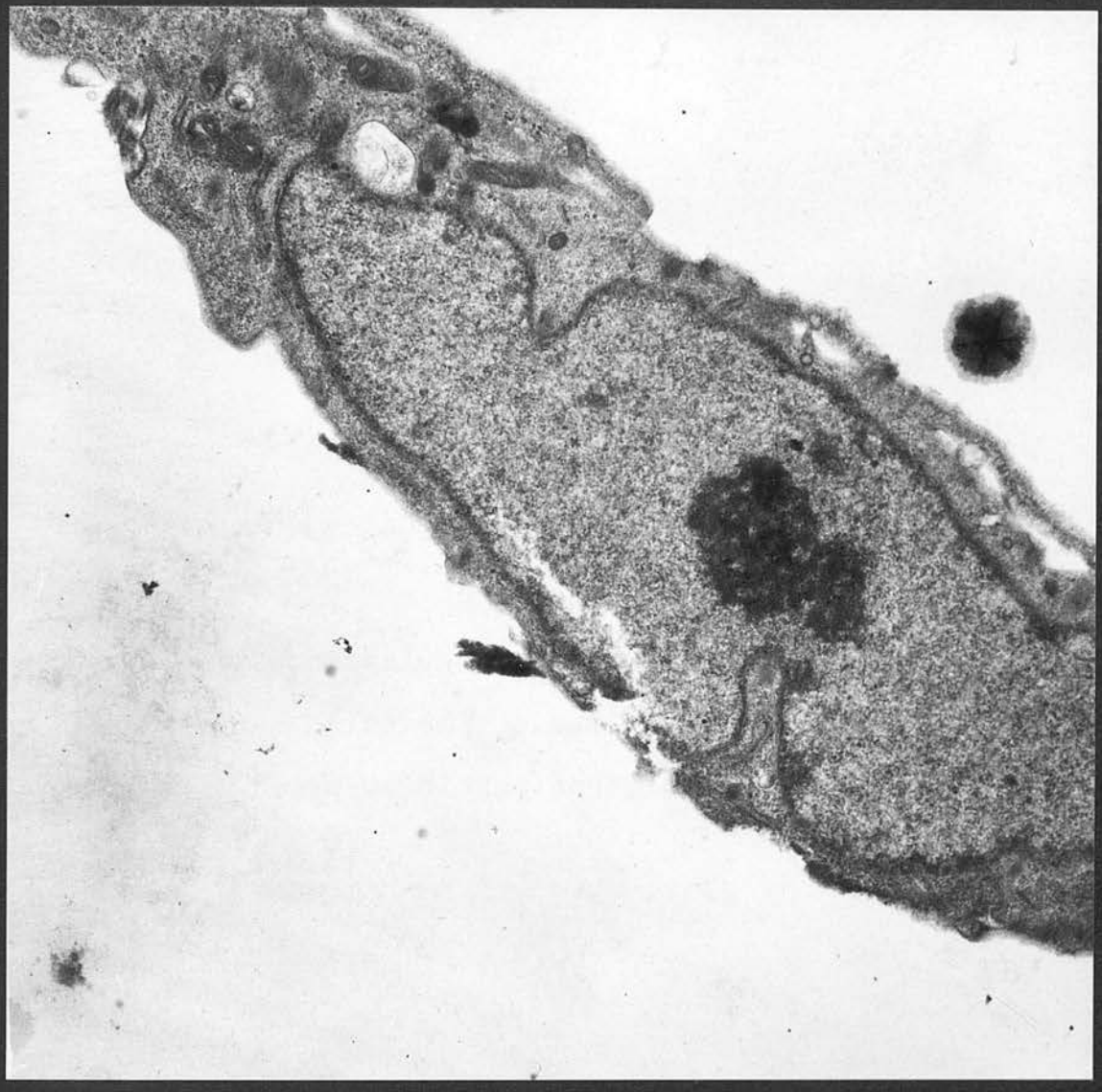


PLATE 89: Electron micrograph of FLK cell cultures two hours after inoculation with culture-adapted orf virus. Complete orf virus particles are present in distorted cells, the organelles of which are ill-defined. Vacuoles of different size and shape occur within these cells but they do not contain virus particles. X 20,000

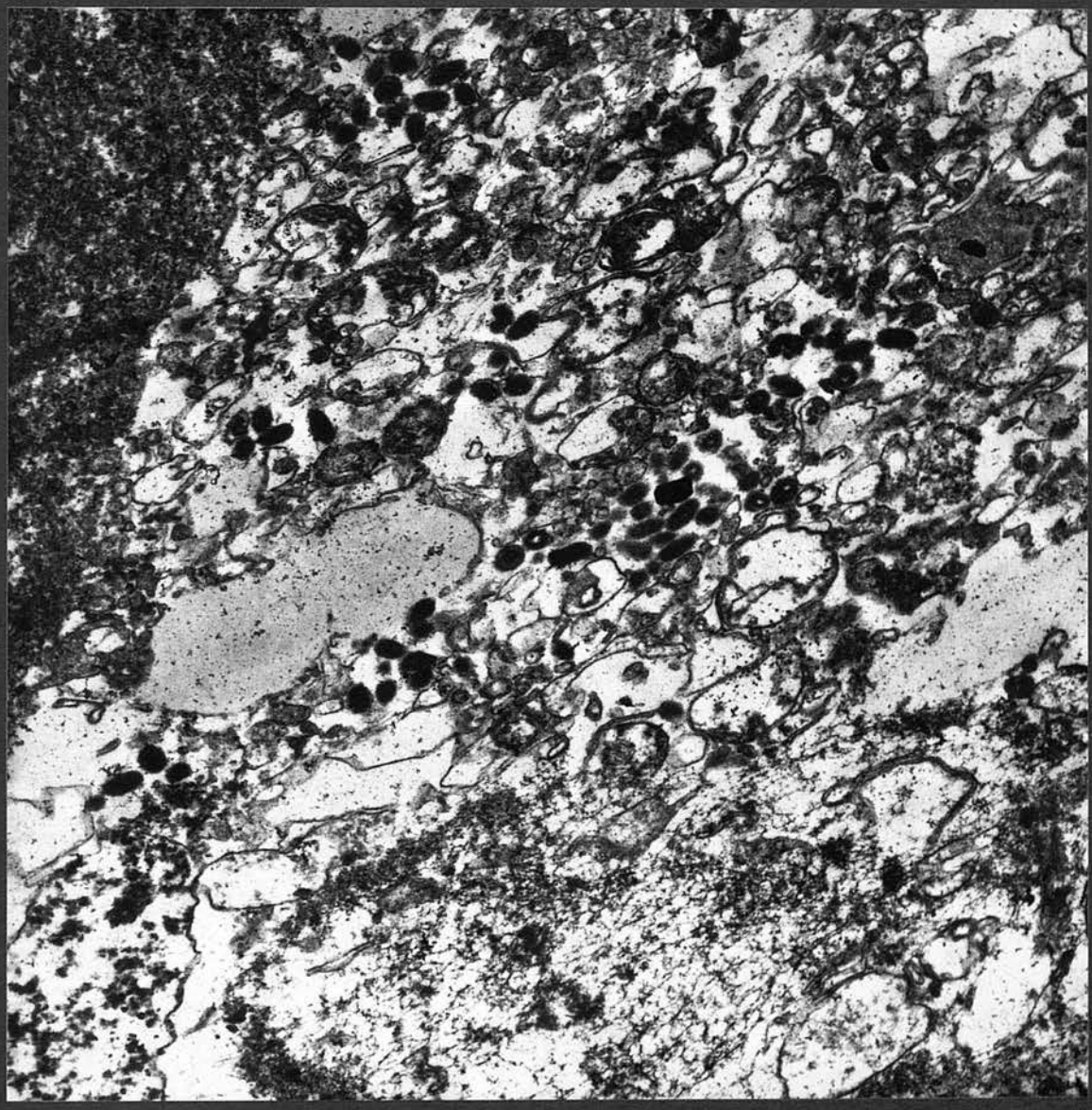


PLATE 90: Electron micrograph of FLK cell cultures two hours after inoculation with culture-adapted orf virus. Electron-dense granular clumps are present in the cytoplasms of undistorted and well-defined cells. No virus particles, mature or immature, are present within these clumps. X 15,000

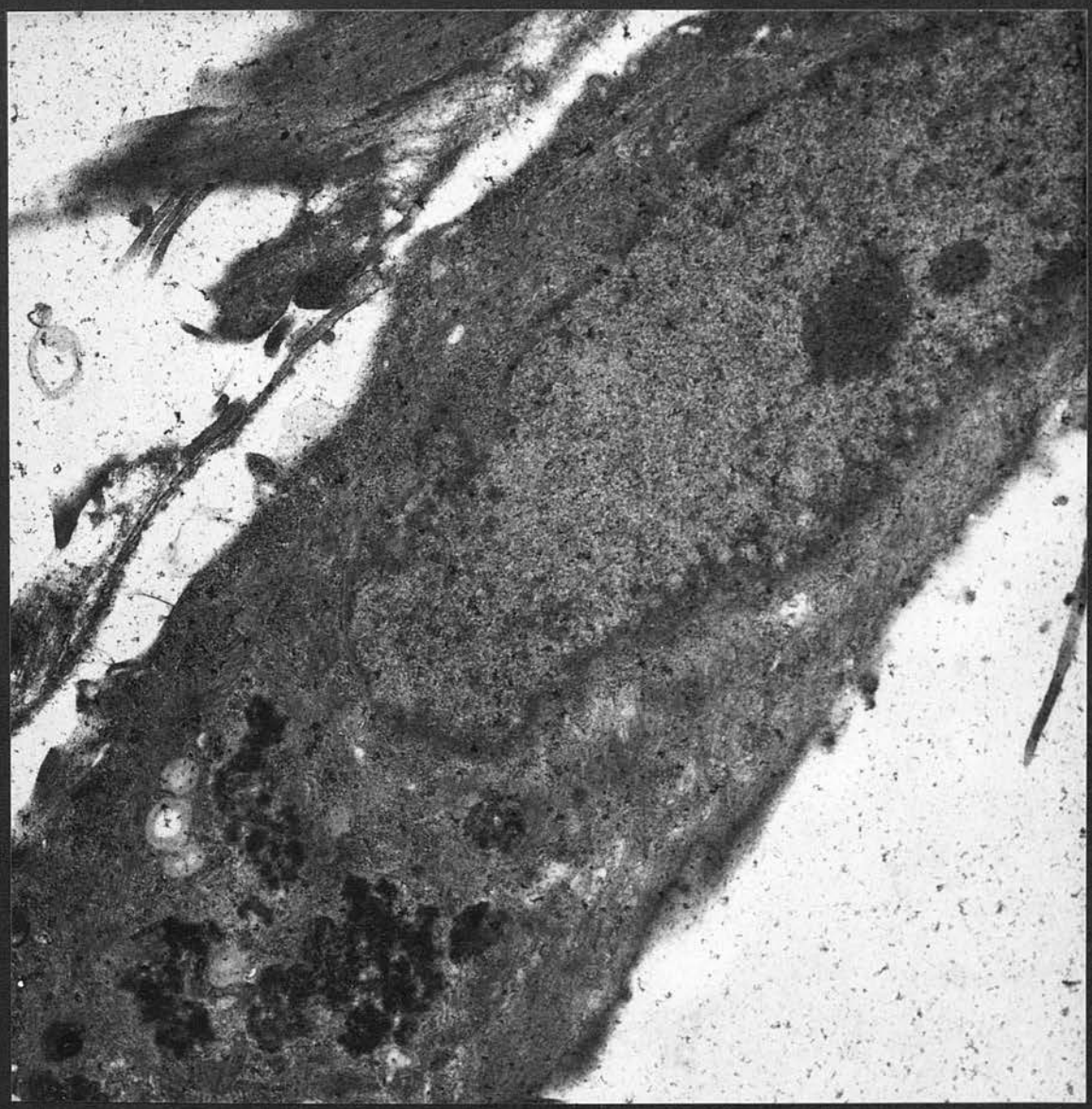


PLATE 91: Electron micrograph of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus. Most of the cells are infected. Immature and a few mature virus particles are present.

x 6,000

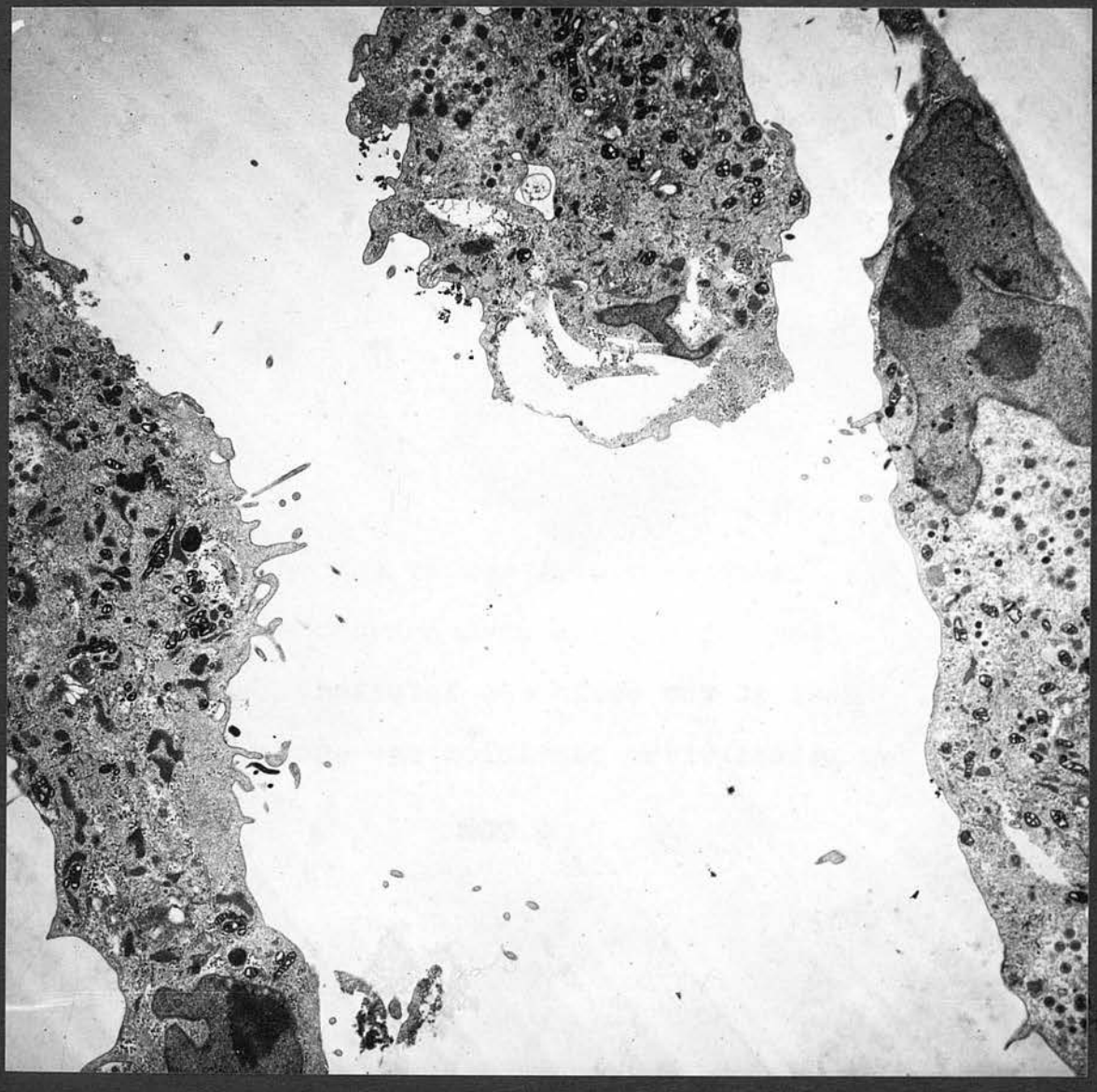


PLATE 92: Electron micrograph of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus. Immature virus particles in different stages of development appear in the cytoplasms of infected cells. Type I immature virus particles are numerous and characterized by having low-dense granular cores within two outer membranes. X 15,000

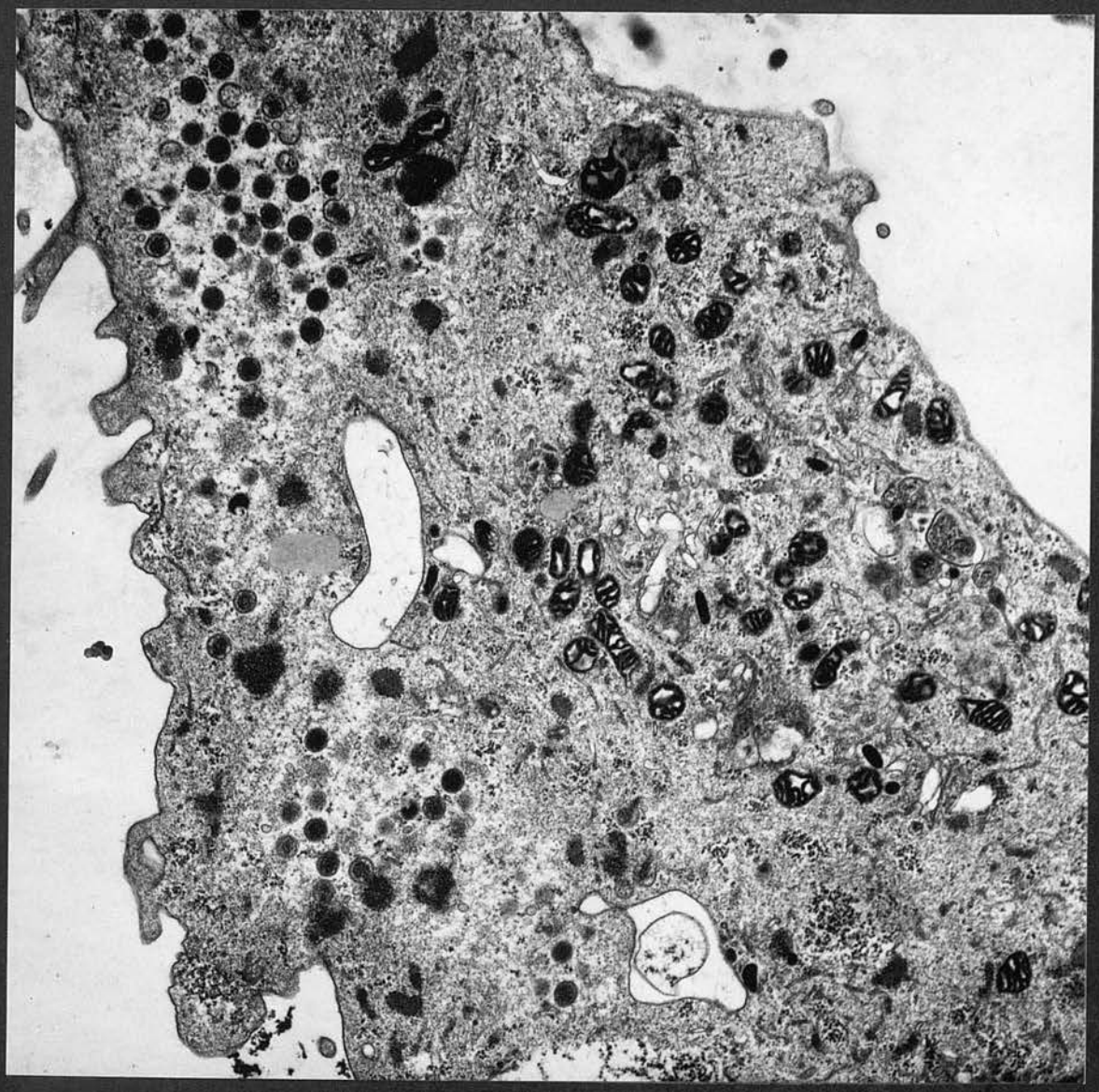


PLATE 93: Electron micrograph of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus. Type II immature virus particles are present in the cytoplasms of infected cells. They are characterized by having electron-free zones between the central cores and two outer membranes. X 38,000

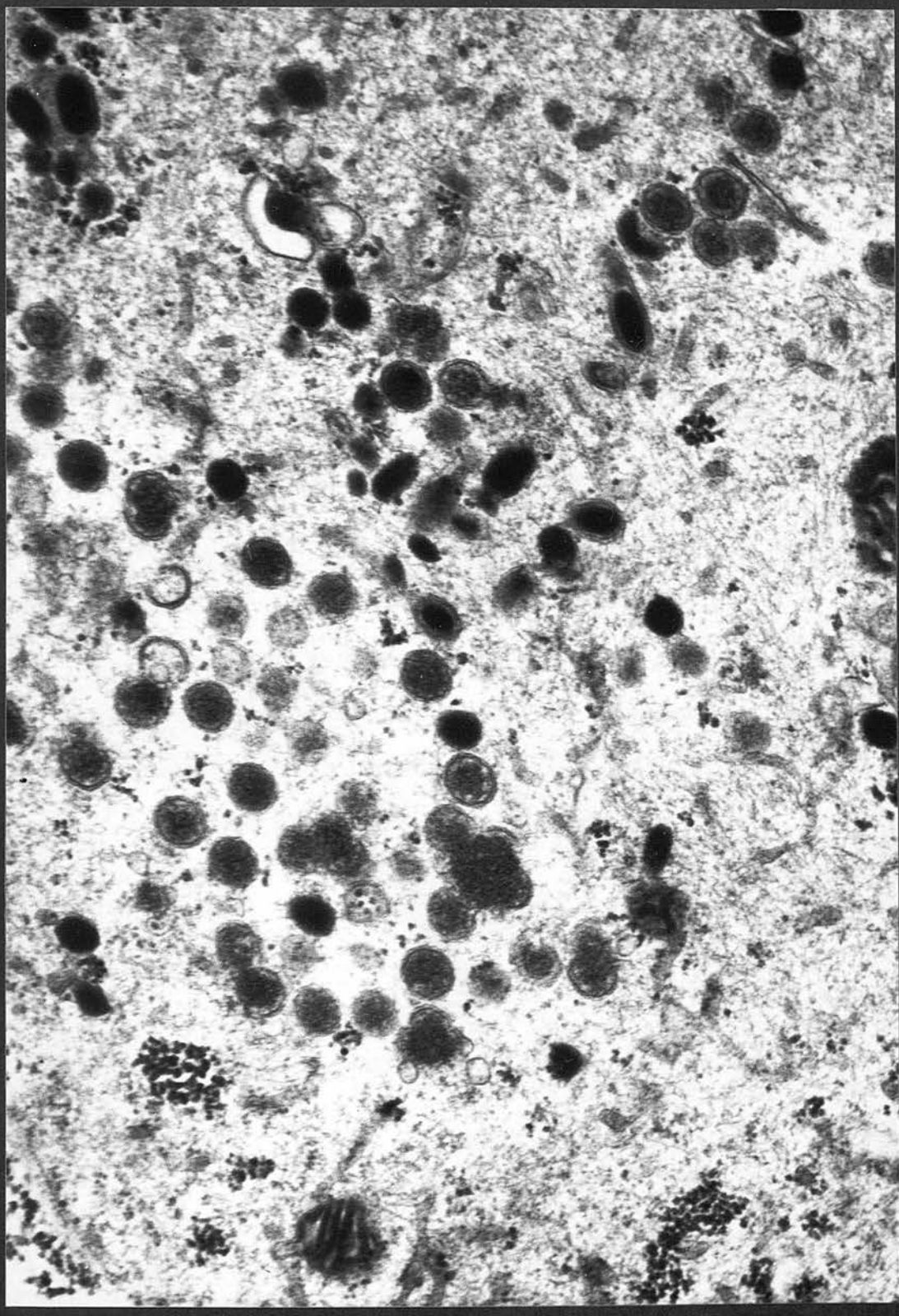


PLATE 94: Electron micrograph of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus. Type III immature virus particles occur in the cytoplasms of infected cells. They possess an electron-dense eccentrically placed body in their cores. X 38,000

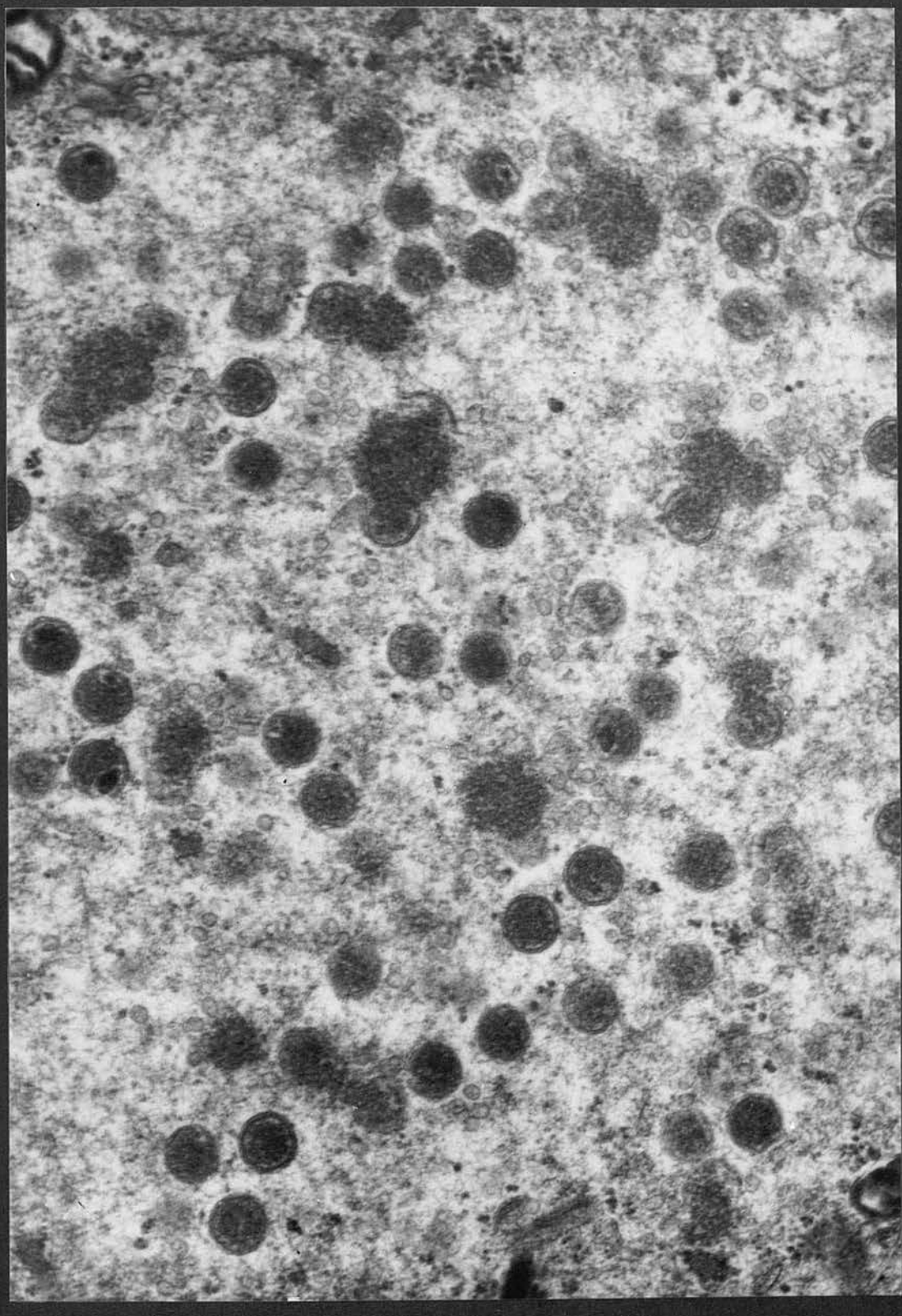


PLATE 95: Electron micrograph of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus. Type IV immature virus particles are present in the cytoplasms of infected cells. They are empty shells of two outer membranes. X 40,000

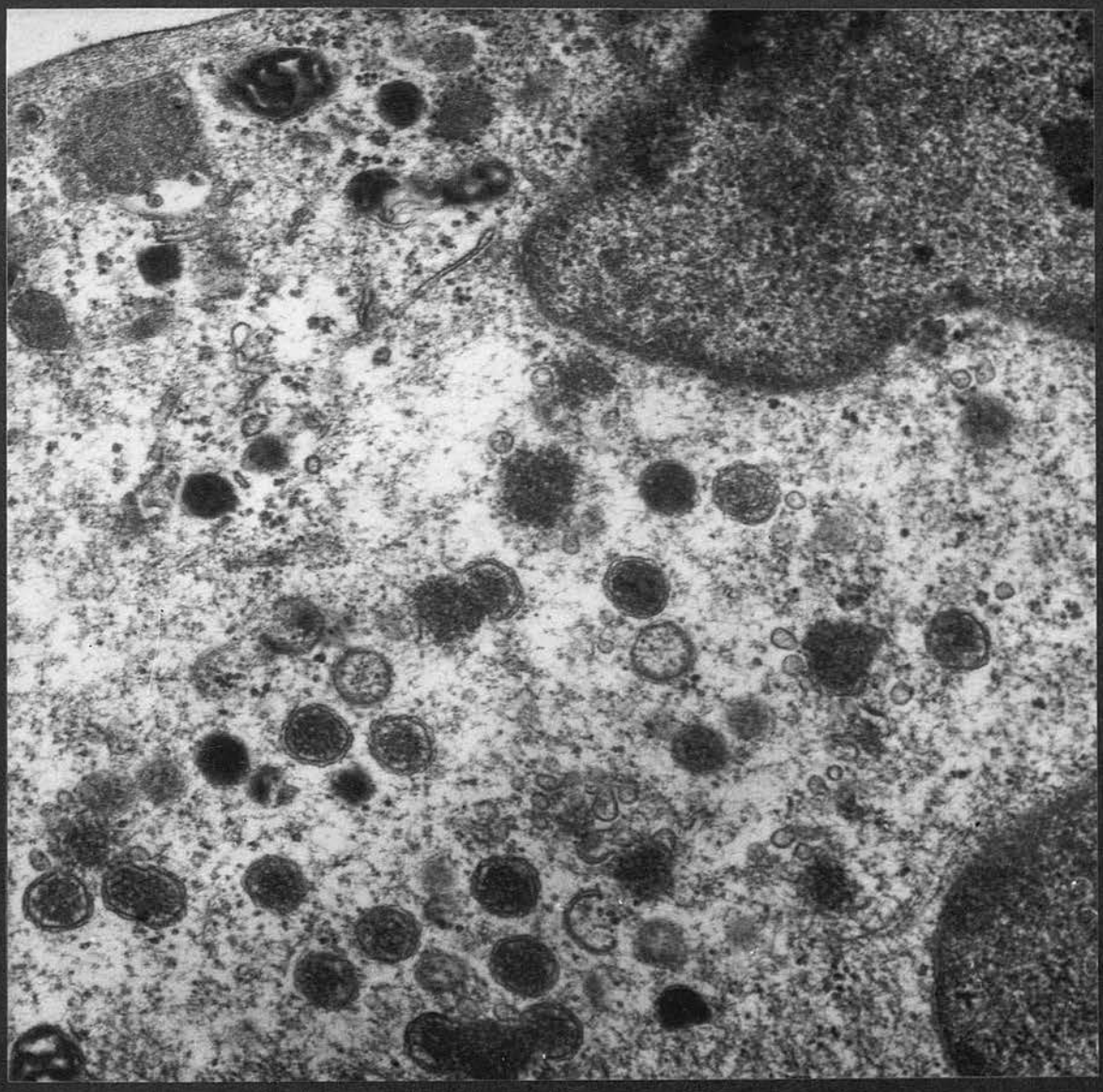
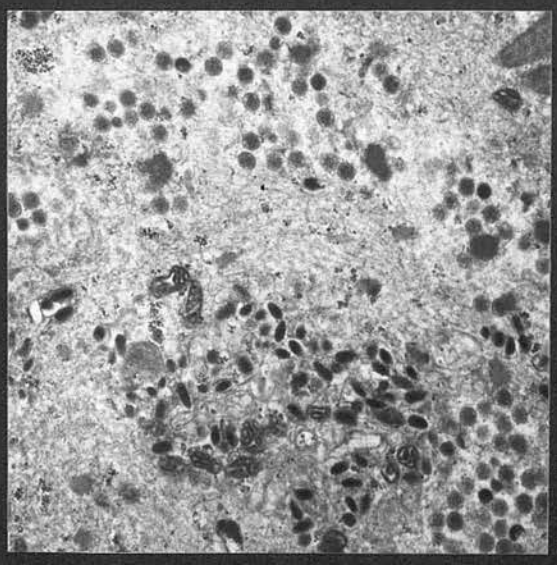


PLATE 96: Electron micrographs of FLK cell cultures 16 hours after inoculation with culture-adapted orf virus.

Upper: Virus particles, both mature or immature, are present near the nucleus. The mature virus particles are few in number. X 7,500

Lower: Mature virus particles occur near the cell membrane of the infected cell. X 30,000



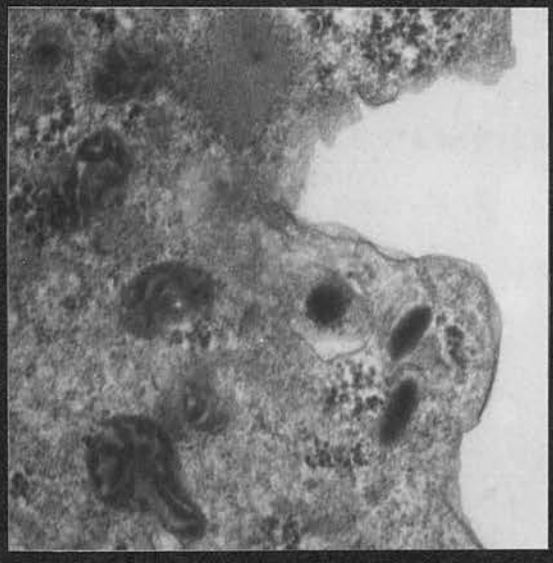


PLATE 97: Electron micrograph of FLK cell cultures 20 hours after inoculation with culture-adapted orf virus. Most of the cells are infected, having in their cytoplasms either virus particles in different stages of maturity or electron-dense aggregates.

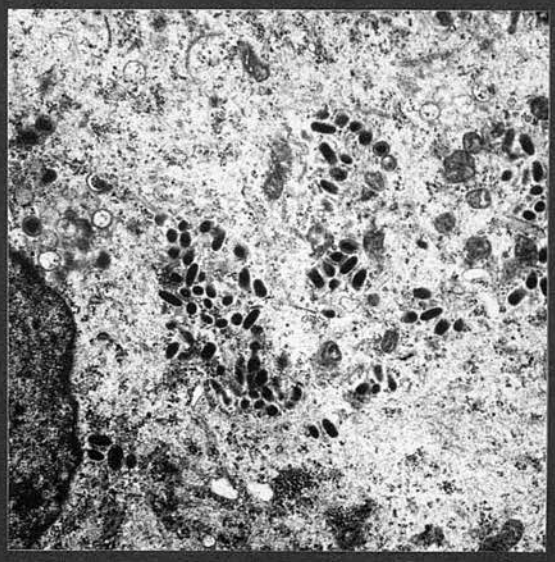
X 10,000

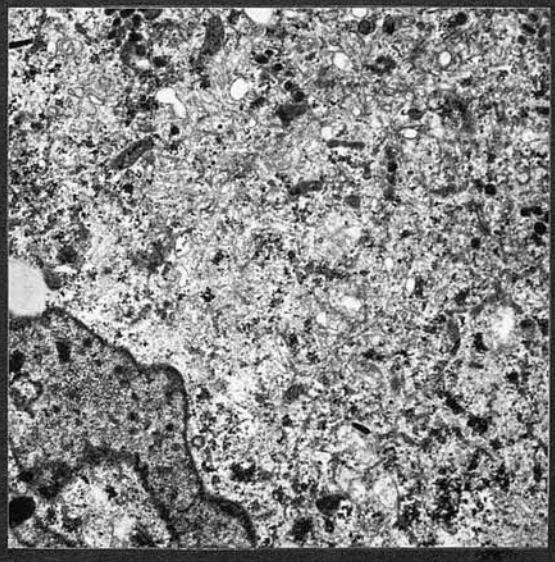
PLATE 98: Electron micrographs of FLK cell cultures inoculated with culture-adapted orf virus.

Upper: 48 hours post-inoculation. Virus particles in different stages of development are still evident. X 10,000

Middle: 54 hours post-inoculation. X 7,500

Lower: 72 hours post-inoculation. The infected cells are relatively distorted showing some degenerative changes in their cytoplasmic organelles. X 7,500





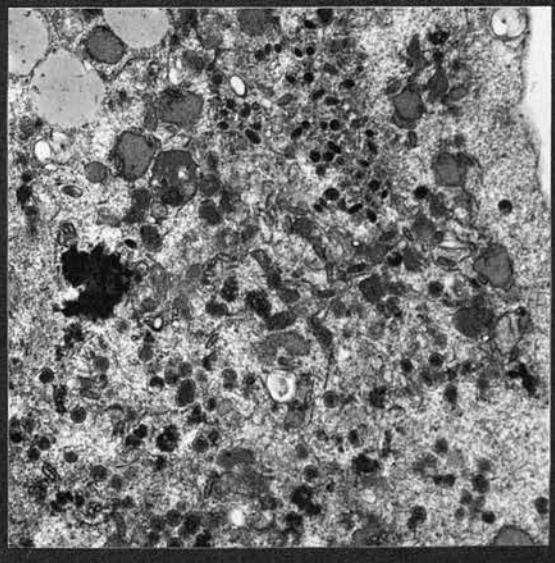
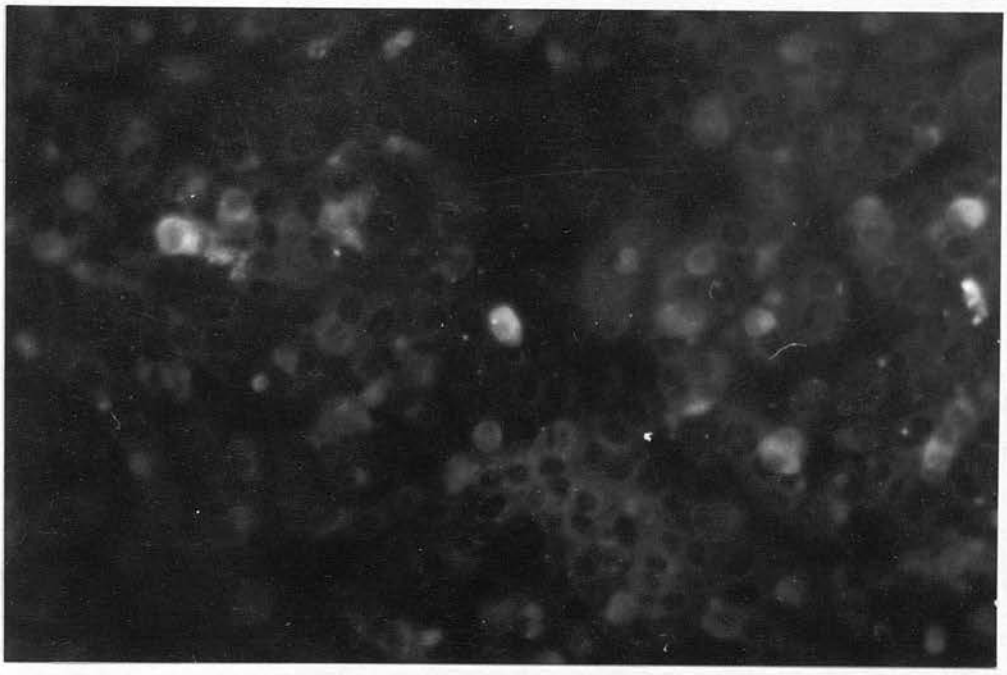
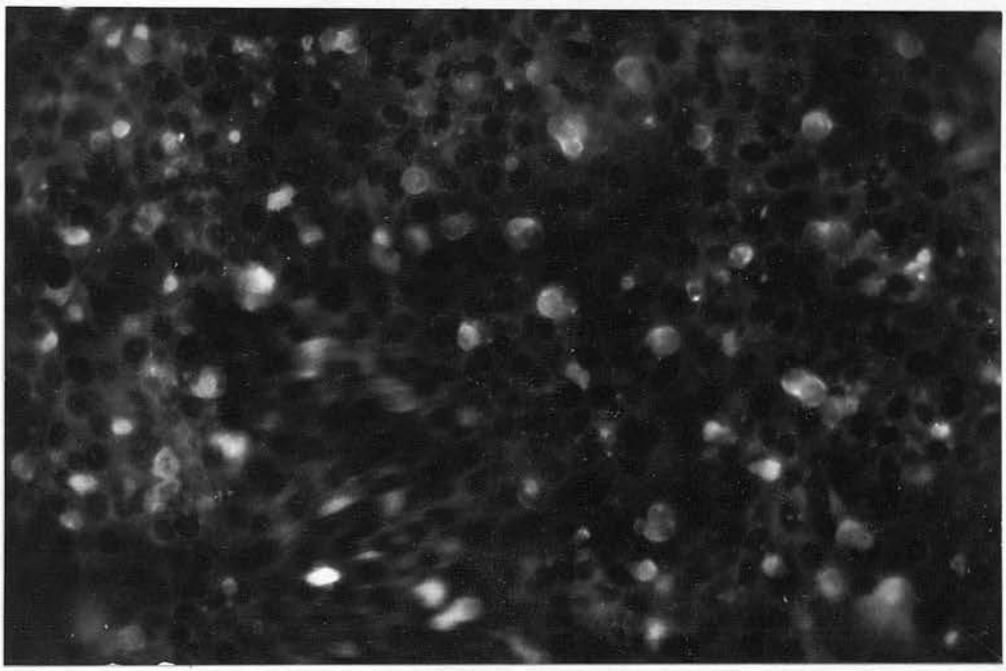


PLATE 99: VERO cell-line cultures 20 hours after inoculation with culture-adapted orf virus. Specific fluorescence for orf virus is evident as a few bright dots in the cytoplasms but not in the nuclei of infected cells. X 500

PLATE 100: VERO cell-line cultures 72 hours after inoculation with culture-adapted orf virus. Specific fluorescence is present in the cytoplasms of infected cells. X 500

PLATE 101: Normal VERO cell-line cultures. X 500





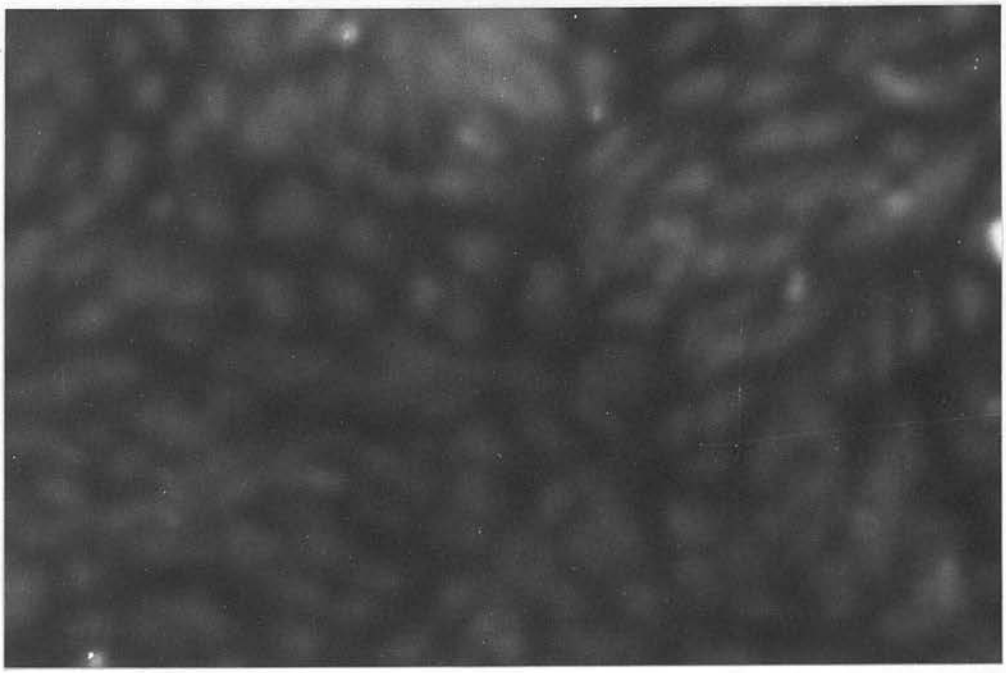


PLATE 102: Electron micrograph of the skin of a previously infected sheep inoculated with orf virus intravenously five days before. The biopsy was taken from the scarified site. Virus particles in different stages of maturity occur in the uppermost cells of the Stratum granulosum. Mature virus particles are also present extracellularly.

x 10,000

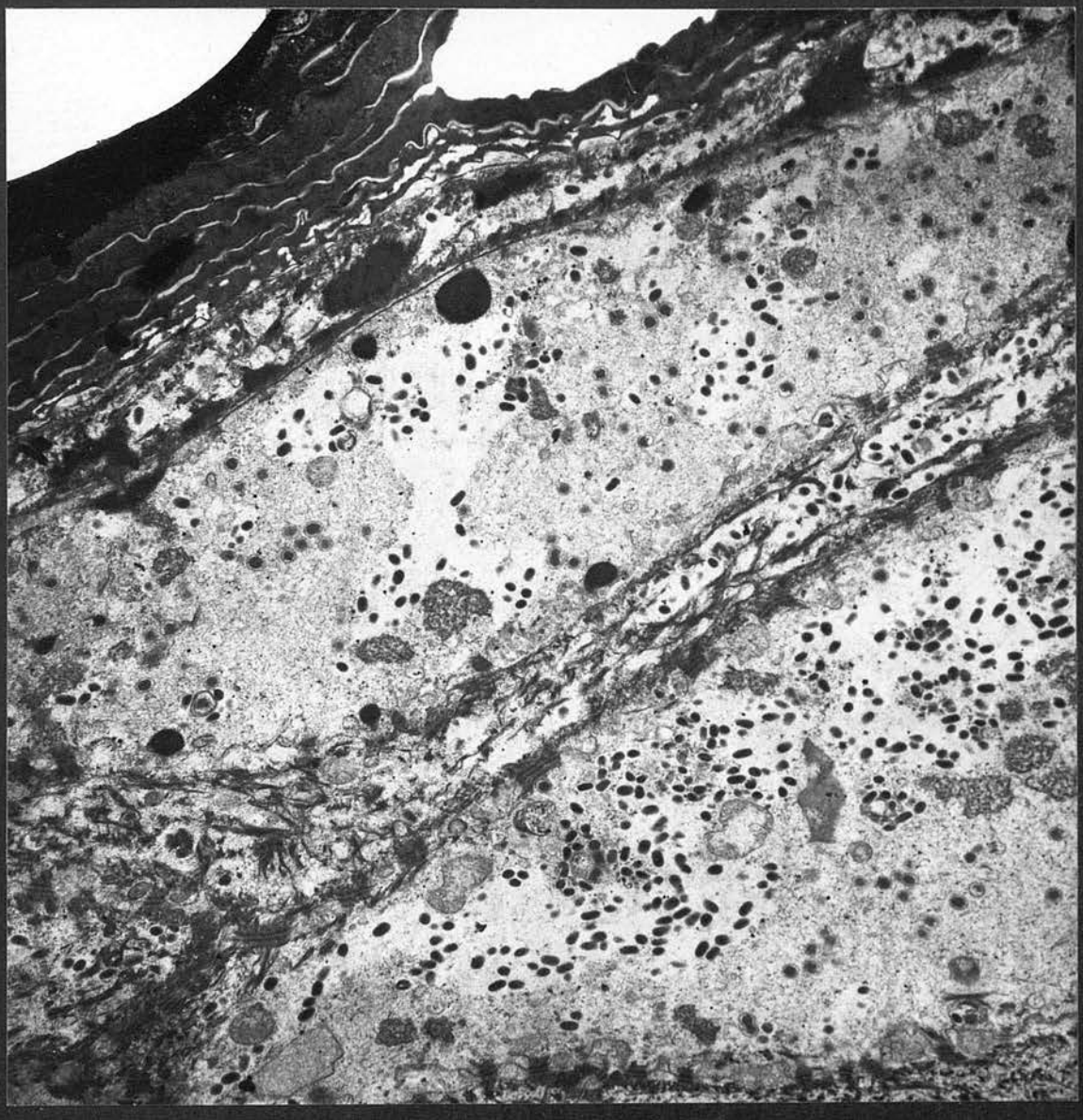


PLATE 103: Orf reactions in susceptible lambs.

Upper: The lamb which received hyperimmune anti-orf serum.

Lower: The lamb which received normal serum.


Lamb no
674
10 days PI
4.11.74

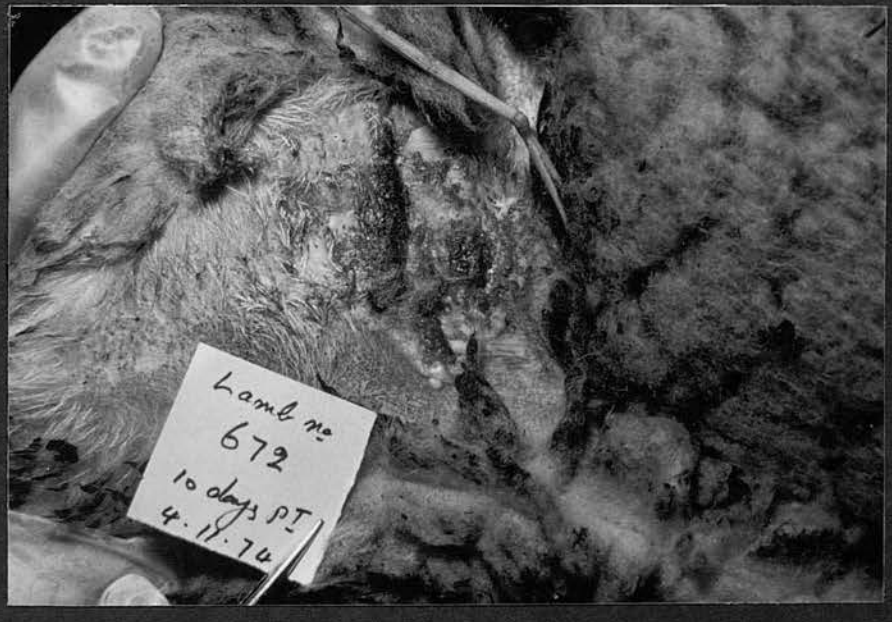

Lamb no
672
10 days PI
4.11.74

PLATE 104: Orf reactions in susceptible lambs.

Upper: The lamb which was inoculated with sensitized splenic cells.

Lower: Control lamb.


Lamb no
673

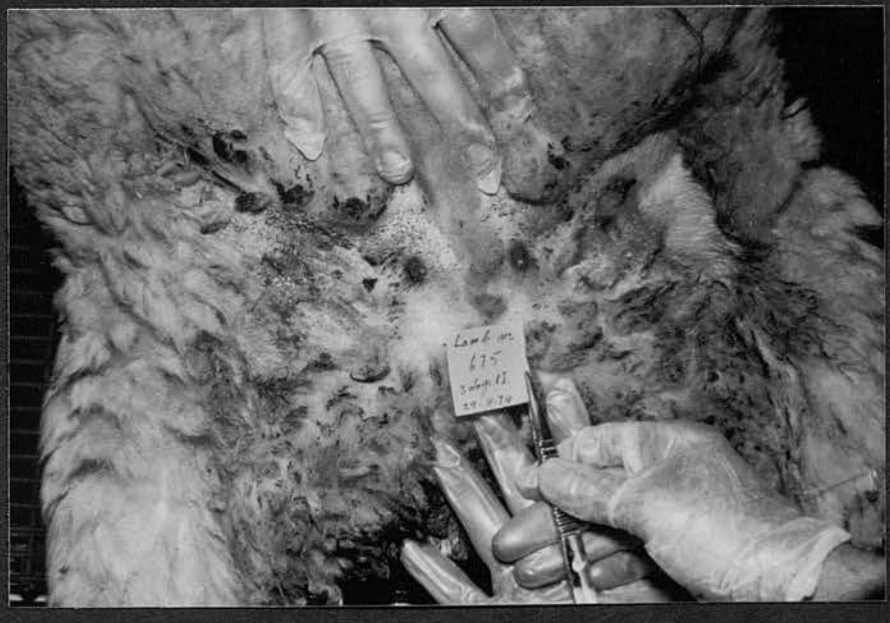

Lamb no
675

PLATE 105: Orf reactions in susceptible lambs.

Upper: The lamb which was inoculated with sensitized thymic cells.

Lower: Control lamb.


Lamb no
687
21 days PI
7-1-75


Lamb no
688
21 days PI
7-1-75

ACKNOWLEDGEMENTS

This work was made possible by the financial support of the Ministry of Agriculture and the Veterinary Research Laboratories of the Arab Republic of Egypt and I am very grateful to them. Thanks are also due to Professor Sir Alexander Robertson for the opportunity to undertake this work at the Centre for Tropical Veterinary Medicine and to the late Professor A. Muir for his guidance and advice on electron microscopy.

I wish to express my sincere thanks to Dr. G. R. Scott, my Supervisor, for his guidance, advice and constructive criticism and for his assistance in statistical analyses.

APPENDIX TABLE 1 (Cont'd)

28	♂ Lamb	3	4	6	8	14	42
29	♀ Lamb	3	4	6	8	14	35
30	474	3	4	6	8	13	27
31	475	3	4	6	8	13	27
32	476	3	4	6	8	13	27
33	477	3	4	6	8	13	27
34	478	3	4	6	8	13	27
35	1	3	4	6	8	13	27
36	2	3	4	6	9	12	30
37	3	3	4	6	9	12	35
38	4	3	4	6	9	12	35
39	652	3	4	5	9	12	23
40	665	2	3	4	7	12	28
41	671	3	4	6	8	11	26
42	668	2	3	5	7	11	28
43	667	3	4	6	7	10	28
44	672	3	5	6	8	11	25
45	674	3	4	6	9	12	Dead
46	669	2	3	5	8	12	34
47	673	2	3	6	7	11	28
48	675	2	3	6	8	10	41
49	687	2	3	4	8	10	20
50	688	2	3	4	6	10	20
51	252	2	3	5	6	10	33
52	248	2	3	5	8	12	25
53	249	2	3	5	8	12	25
54	246	2	3	5	8	12	25
55	250	2	3	5	8	12	25
56	235	2	4	5	8	12	25
57	332	2	3	5	8	10	23
58	20	2	3	4	7	10	19
59	501	3	4	5	8	11	19
60	534	3	4	6	7	10	20
61	497	2	3	5	8	11	27
62	550	3	4	6	7	10	35
					8	12	28

APPENDIX TABLE 1 (Cont'd)

63	543	3	4	6	8	10	23
64	549	3	4	6	8	12	23
65	552	2	3	4	7	11	27
66	520	3	4	5	8	11	24
67	521	3	4	5	8	11	21
68	584	2	3	4	7	12	25
69	442	2	3	5	8	12	39
70	542	2	3	4	7	11	25
71	639	2	3	4	7	10	25
72	509	3	4	5	7	10	24
73	637	3	4	5	8	10	20
74	617	3	4	6	8	11	25
75	544	3	4	5	7	10	26
76	604	2	3	4	6	10	19
77	459	3	4	5	7	12	21
78	642	3	4	5	8	11	19

APPENDIX TABLE 2.

The onsets of the stages of orf lesion development in previously infected sheep in days after scarification

Serial Number	Number of the Animal	Stages				
		Papule	Vesicle	Pustule	Scab	Resolution
1	69	3	4	5	8	13
2	74	3	4	5	7	13
3	104	3	4	5	8	13
4	105	3	4	5	7	13
5	83	0	0	0	0	0
6	111	3	4	5	7	14
7	161	2	3	4	6	14
8	166	2	3	4	6	14
9	6	3	4	5	8	14
10	138	3	4	5	7	13
11	158	3	4	5	7	14
12	178	3	4	5	7	13
13	186	3	4	5	7	15
14	191	3	4	5	7	14
15	239	0	0	0	0	0
16	221	3	4	5	6	15
17	222	3	4	5	8	15
18	224	3	4	5	7	15
19	234	3	4	5	6	15
20	245	3	4	5	7	15
21	00	3	4	5	7	16
22	229	3	4	5	7	16
23	231	3	4	5	7	16
24	247	0	0	0	0	0
25	170	3	4	6	8	15

APPENDIX TABLE 2 (Cont'd)

26	127	3	4	6	8	15
27	000	3	4	6	8	14
28	1	2	3	5	7	15
29	2	2	3	4	6	15
30	7	2	3	5	7	15
31	9	2	3	4	6	15
32	295	3	4	6	9	17
33	296	3	4	6	9	17
34	138	3	4	6	9	17
35	346	3	4	6	9	17
36	347	4	5	6	8	16
37	169	3	4	5	7	16
38	345	2	3	4	8	15
39	348	2	3	4	7	16
40	349	2	4	6	8	14
41	352	2	4	6	8	15
42	350	4	5	7	9	16
43	336	4	5	7	9	16
44	178	3	4	6	8	11
45	351	4	5	6	8	11
46	210	2	4	7	9	14
47	364	3	4	6	8	11
48	306	3	4	5	7	17
49	308	3	5	6	9	17
50	361	3	4	5	7	14
51	362	3	4	5	7	16
52	366	4	5	6	8	16
53	373	4	5	6	8	16
54	300	3	4	6	8	15
55	371	3	4	6	8	15
56	236	3	4	5	7	15
57	365	3	4	5	7	15
58	372	3	4	5	7	16
59	379	3	4	5	7	16
60	233	3	4	5	6	11

APPENDIX TABLE 2 (Cont'd)

61	188	3	4	5	7	11
62	267	2	4	6	8	15
63	170	2	3	4	5	8
64	397	3	4	5	8	14
65	396	3	4	5	7	14
66	401	3	4	6	8	17
67	330	3	4	5	7	15
68	217	3	4	5	7	14
69	395	3	4	6	8	17
70	408	2	3	5	8	16
71	406	2	3	4	7	16
72	384	2	3	5	8	16
73	213	3	4	5	8	16
74	404	2	3	4	8	17
75	413	2	3	4	8	17
76	417	3	5	7	9	17
77	411	4	5	6	8	17
78	378	3	4	5	8	14
79	235	3	4	5	8	14
80	405	3	4	5	8	14
81	409	3	4	5	8	14
82	407	3	5	6	8	17
83	420	3	5	6	8	17
84	419	2	5	6	8	17
85	422	3	5	6	8	17
86	418	4	5	6	8	15
87	423	0	0	0	0	0
88	390	4	5	6	8	15
89	377	3	4	5	7	15
90	375	3	4	5	7	15
91	385	3	4	5	7	15
92	305	3	4	5	7	15
93	416	3	4	5	7	16
94	414	2	3	4	6	14

APPENDIX TABLE 2 (Cont'd)

129	541	3	4	5	8	14
130	524	3	4	5	8	13
131	553	3	4	5	8	17
132	558	3	4	5	8	13
133	513	3	5	6	8	15
134	546	3	5	6	8	15
135	548	3	5	6	8	15
136	503	3	5	6	8	17
137	511	3	5	6	8	15
138	515	3	5	6	8	15
139	517	0	0	0	0	0
140	515	2	3	4	5	7
141	499	2	3	4	5	7
142	573	2	3	4	5	7
143	552	2	3	5	7	12
144	442	3	4	5	8	15
145	555	3	4	5	7	13
146	540	3	4	5	7	13
147	554	3	4	5	7	13
148	539	2	3	5	7	15
149	535	2	3	5	7	13
150	567	2	3	5	7	13
151	533	2	3	5	7	13
152	560	3	4	5	7	15
153	455	3	4	5	7	16
154	563	3	4	5	7	14
155	514	3	4	5	7	15
156	561	3	4	5	7	15
157	568	3	4	5	7	15
158	559	3	4	5	8	17
159	562	3	4	5	8	17
160	616	3	4	5	7	14
161	495	3	4	5	7	14
162	384	3	4	5	7	14
163	601	2	3	4	6	12

APPENDIX TABLE 2 (Cont'd)

199	569	2	3	4	6	10
200	609	2	3	4	6	10
201	605	3	4	5	7	14
202	607	0	0	0	0	0
203	651	3	4	5	7	17
204	650	3	4	5	7	14
205	606	3	4	5	7	17
206	509	0	0	0	0	0
207	648	3	4	5	7	17
208	657	3	4	5	7	17
209	644	3	4	5	7	17
210	649	4	5	6	7	14
211	646	0	0	0	0	0
212	641	4	5	6	7	14
213	613	4	5	6	8	18
214	663	3	4	5	7	15
215	662	3	4	5	7	15
216	617	3	4	5	7	15
217	475	3	4	5	7	15
218	565	4	5	6	8	18
219	608	3	4	5	7	15
220	611	0	0	0	0	0
221	454	2	3	4	6	9
222	415	3	4	5	7	15
223	631	3	4	5	7	15
224	642	3	4	5	7	15
225	647	3	4	5	7	15
226	425	3	4	5	7	13
227	665	0	0	0	0	0
228	435	3	4	5	7	13
229	564	3	4	5	7	15
230	664	3	4	5	7	15
231	638	4	5	6	8	17
232	661	3	4	5	7	13
233	637	3	4	5	7	13

APPENDIX TABLE 2 (Cont'd)

234	629	3	4	5	7	15
235	393	3	4	5	8	17
236	660	3	4	5	8	17
237	648	4	5	6	9	18
238	644	2	3	4	6	11
239	667	0	0	0	0	0
240	388	3	4	5	7	15
241	392	3	4	5	7	15
242	674	3	4	5	7	15
243	669	3	4	5	8	17
244	697	2	3	4	6	10
245	696	3	4	5	8	17
246	689	2	3	4	6	10
247	698	3	4	5	8	17

APPENDIX TABLE 3.

The results of ultrathin section examination of the skin biopsy samples collected from susceptible sheep at intervals

Sheep Number	Days Post-infection																								
	0	0·25	0·75	1·0	1·25	1·75	2	3	4	6	7	8	10	14	15	17	21	22	23	28	35	36	42	49	56
L1	-							+					+			+	-			-		-	-		
L2				-						+		+		+				-			-			-	
540			-			+			+						+				-	-	-		-	-	-
541		-			+		+				+				-		-								
476								+			+				-										
475											+				-										
652									+					+		-									
665												+					-								
671											+					-									
668							+			+															
667					+									-											
669									+				+												

APPENDIX TABLE 4.

The results of ultrathin section examination of the skin biopsy samples collected from previously infected sheep at intervals

Sheep Number	Days post-infection											
	0	0·75	1	2	3	4	5	6	7	8	10	11
295	-				+					-		
296			-					+			-	
474						+						-
5	-		-									
490	-			-								
492		-					+					
477					+				-			
523						+				-		
552				-								
442								+			-	
520					+							
521					+							
559					+				-			
562					+					-		
601							+				-	
595							+			-		
597					-							
598					-							
322							+					
625							+					
630									-			
635									-			
638					+				+			
639					+				+			
606									+			
644									-			
351							+					
657									-			
415								+				
425									+			-
435									+			-